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**HEALTH
CHATS**
WITH
Young Readers

Mrs. M. A. B. KELLY



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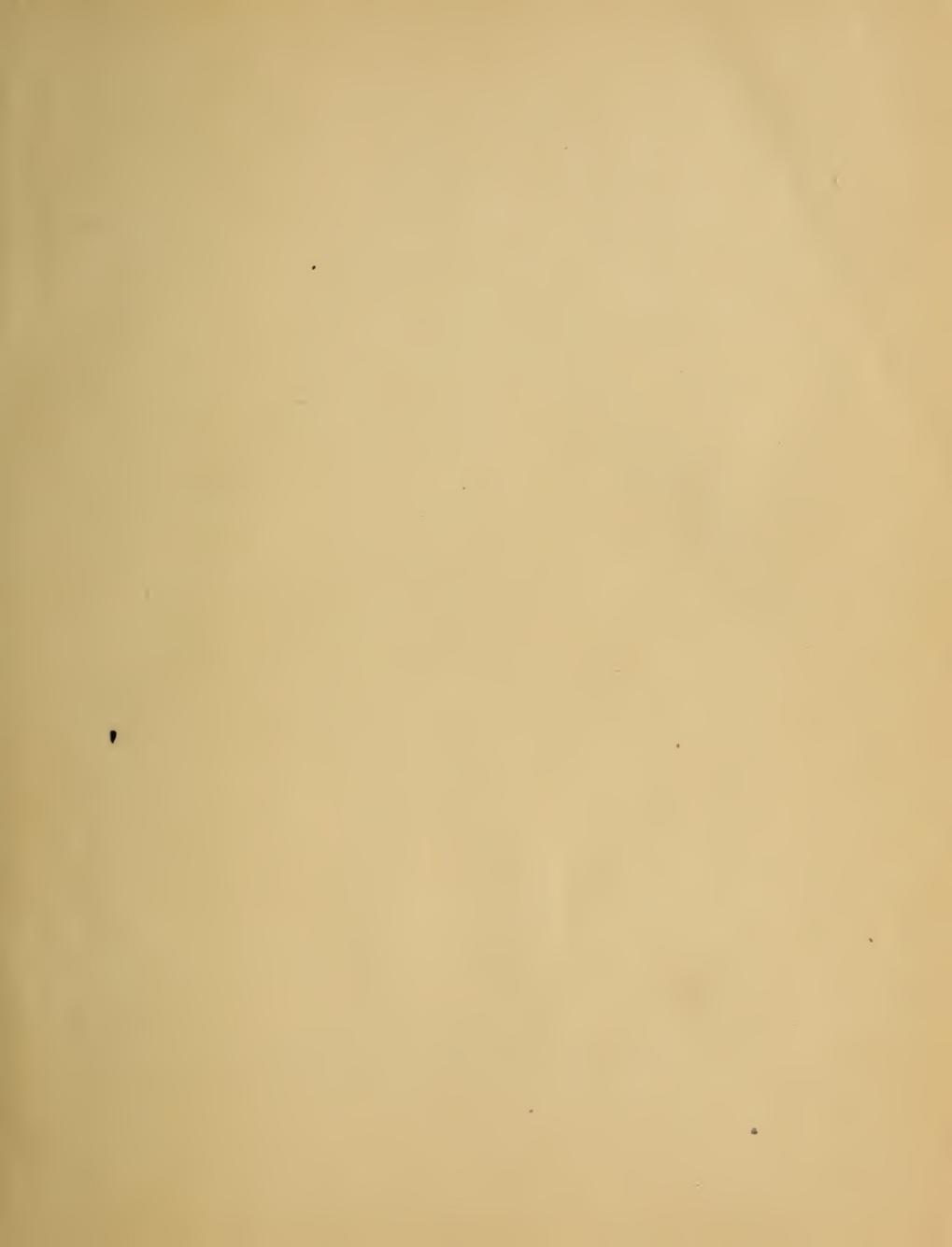
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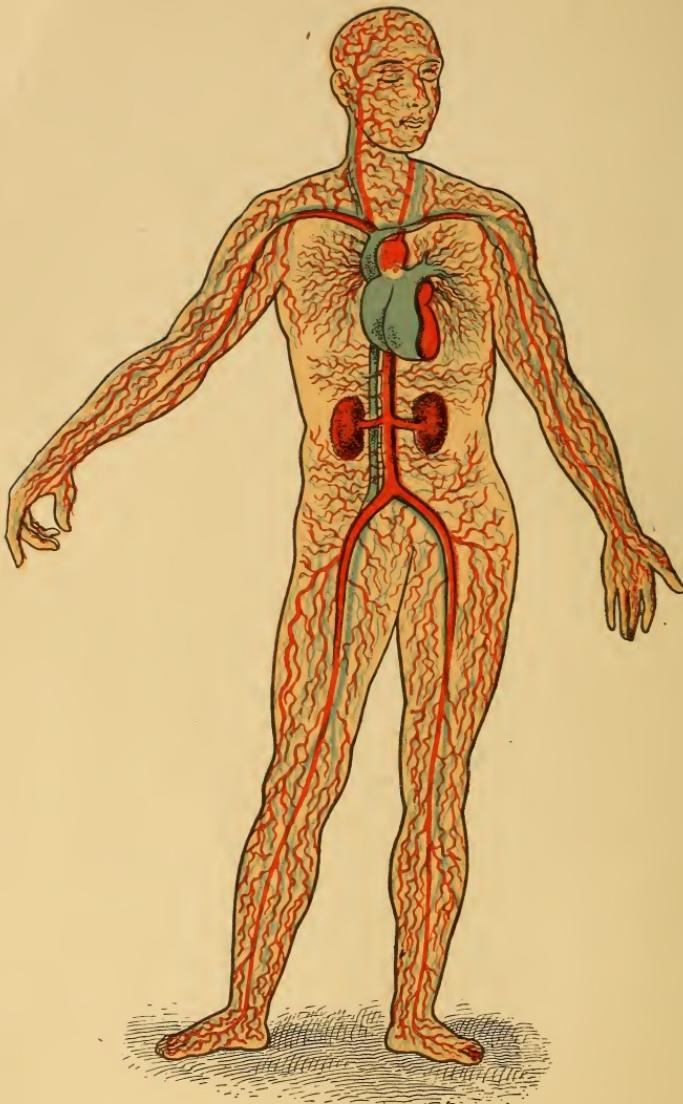
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UNITED STATES OF AMERICA.

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CIRCULATION OF THE BLOOD.

HEALTH CHATS

WITH YOUNG READERS

BY

MRS. M^A. B. KELLY,

*Author of "A Volume of Poems," "Leaves from Nature's Story-Book,"
"Short Stories of Our Shy Neighbors," etc.*

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PREFACE.

This volume is in no wise intended as a text-book upon the subjects of either Anatomy, Physiology, or Hygiene; on the contrary, it has been prepared expressly for supplementary reading.

Furthermore, the nomenclature of the text-book proper is almost wholly omitted; but it is hoped that the practical suggestions herein presented will arouse a spirit of enquiry that shall lead later on, to a careful study of the above mentioned subjects; and should such be the result, the volume will have fulfilled its mission.

For many years, the author has made a specialty of this department of instruction; and the manifest enthusiasm of students pursuing this branch of study, has been a continual inspiration to renewed effort in getting at the best methods of its presentation.

Finally, after devoting much time to careful observation among the schools of this country, as well as those of Europe, the author has become fully convinced that there is a demand for supplementary work of this kind.

And this conviction has been materially strengthened by the favorably expressed opinions of many prominent educators, both at home and abroad, who are working along this line of study.

For valuable aid, in the way of critical examination of various portions of the work, grateful acknowledgment is due to the following gentlemen of the medical profession: Dr. James Kraus (Sen.), Carlsbad, Austria; Dr. H. F. Biggar, Cleveland, O.; Drs. A. Vander Veer, F. C. Curtis, C. S. Merrill, and C. M. Culver, Albany, N. Y.; and Drs. Geo. T. Stevens, W. E. Rounds, and Geo. Tucker Harrison, New York City.

Among prominent educators, from whom many helpful suggestions have been received, are Dr. David E. Smith, Principal of State Normal School, Brockport, N. Y.; Dr. C. E. Beecher, Yale University, New Haven, Conn.; Dr. C. C. Blackshear, Woman's College, Baltimore, Md., and Prof. Charles H. Peck, State Botanist, N. Y.

And now, with the sincere hope that the little book may carry with it a goodly share of influence toward popularizing that very important command, "Man, know thyself," it is herewith submitted for the kindly acceptance of those for whom it was written.

THE AUTHOR.

SUGGESTIONS TO TEACHERS.

It will be observed that a list of words has been placed at the head of each subject, to be used as a blackboard exercise, before beginning the lesson.

By this arrangement, the pupil will find no difficulty in mastering the new words that he meets, as he advances from topic to topic.

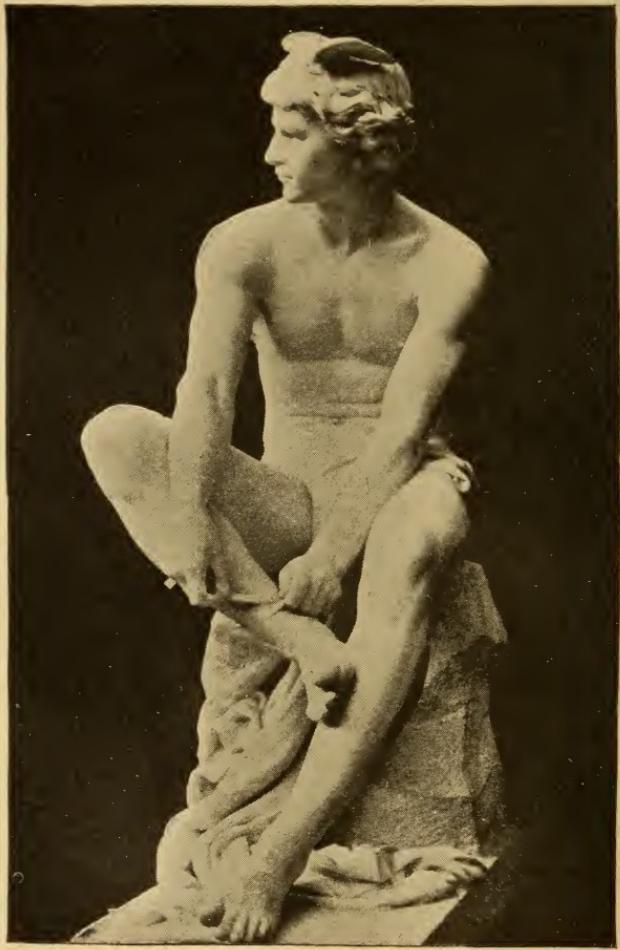
But few technical terms are to be found throughout the work, and such as have been necessarily employed are defined in connection with the subject matter.

It will be well now and then, to place brief statements from each chapter upon the blackboard, for the use of health-hints that are worth remembering.

It is expected that the instructor will carefully examine each chapter before presenting it to the class; and it is most sincerely hoped that the lessons herein contained may prove helpful to the teacher in the way of awakening the pupil's interest concerning a subject so important to us all.

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STATUE OF HERMES.

(J. A. Delorme, Berlin.)

HEALTH CHATS WITH YOUNG READERS.

CLARA'S DOLL.

waxen	arrayed	requested
Primrose	several	weariness
shapely	excel	answered
difference	make-believe	necessary

I wish you could have seen it! Such a beautiful waxen doll! Clara gave her the name of Primrose, partly because there was such a deep flush upon her fair, round cheeks, and partly because her pretty red lips looked so very, *very* prim.

She had soft, golden hair that fell about her face in long, glossy curls, and on either side of her shapely head, a tiny ear peeped out that looked ever so much like a small, pink sea-shell.

Her eyes, which were of a deep blue, were made to open and shut as if she were really and truly alive, and Clara did *so* wish that little Primrose could talk!

Her smooth, plump arms were jointed at the elbows, so that they could be easily bent; and when she was seated in her own little chair, her limbs did not stick straight out from her body as the limbs of some dolls do; for she had joints at the knees, by means of which her feet could be made to touch the floor.

Oh, she was a fine doll, I can assure you, and Clara was not only very fond of her, but she was very proud of her, as well; and she used to dress and undress her many times a day, with the greatest care.

One afternoon, Miss Newton, Clara's teacher, told the little girls that they might bring their dolls to school with them, next day.

Clara was greatly pleased with this, and Primrose was arrayed in her finest suit, as you may well suppose.

After the lessons of the morning were finished, Miss Newton said, "Now let us spend a little time with the dolls, and perhaps they can teach us a lesson."

The children clapped their hands with delight, and one of them said, "Oh, that will be fun; but how can our dollies *teach* us anything, when they cannot even talk?"

"Perhaps they can teach us a lesson in some other way," replied Miss Newton.

"Do you not often gain my attention by just raising your hand, or by standing quite still at my desk till I am ready to listen to you?"

"And when you bow your head, in answer to a question that is put to you, does it not mean the same thing as saying 'yes'?"

Very soon, all the dolls were placed in a

row, with Primrose seated at the head; for she was the largest and grandest lady of them all.

"I wonder if these waxen children can stand alone?" said Miss Newton.

"Mine can! Mine can!" cried several voices at once, and then each little mother tried her very best to make her waxen baby stand up straight and strong without help.

But alas! not one among them could stand alone for a single second; and even Miss Primrose tumbled forward on her face, and came very near breaking her proud, little nose in the fall.

"These little ladies have taught us one good lesson already," said Miss Newton, "can any of you tell me what it is?"

The girls were silent for a moment, and then Clara replied, "They have taught us that dollies need something besides legs and joints to help them stand alone."

She looked a little disappointed as she

said this; for although she had never tried to make Primrose stand up, all alone, by herself, yet she felt quite sure that she could do it; and she had hoped to see her excel all the other dollies that were present.

By and by, Miss Newton took hold of little Primrose's right arm, and bent the elbow, so as to raise the hand of the doll nearly on a level with its head.

Then she requested the class to hold their right hands, each in the same position.

The girls did as they were told; but in a short time their arms became tired, and they could hold them up no longer; but there stood Miss Primrose with smiling lips, her hand still raised to her head, and showing no sign of weariness at all.

"How is it that your arms tire out so soon, while the dolly's can be held up for any length of time?" asked the teacher.

"Because we are alive, and the dolls are only made of wax," answered one of the class.

"Yes, that is a very good reason," said Miss Newton; but who can explain the difference between the arms of these waxen children and those of our own?"

The girls were not ready to answer this question; for they had never learned anything about the bones, the joints, and other parts of their arms; and what is more, they had never so much as thought what a fine thing it is to have the power to use their limbs as they pleased.

Now this was just what Miss Newton wanted them to think about; so she said:

"How many of you would like to know how it is that you are able to stand all alone, and to do so many things that your dolls can not do?

"These dainty little ladies are very pretty

to look at; but they are only make-believe children after all.

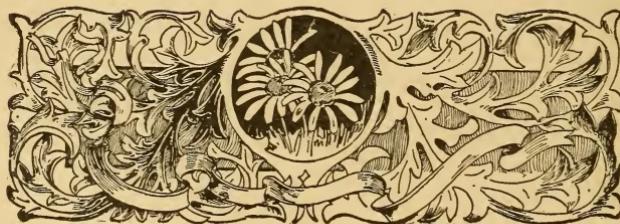
"They can neither see, hear, feel, taste nor smell.

"It is a grand thing to be in this beautiful world of ours; but in order to be quite happy, and to enjoy it all, it is necessary to be well and strong; and to be well and strong, we must know something about our own bodies and how to take care of them; in other words, we must study the laws of health.

"You may not be able to learn everything about the laws of health; but you can learn very much that will be of great use to you through life. How many of you would like to do so?"

In reply, every hand was raised; and so it was agreed that the teacher and her class should spend a few moments together, every day, in chats among themselves, about the different parts of the body, and how to keep the body in good condition.

And now, if you will read this book to the end, you will find that many useful lessons may be learned in chats among ourselves, if we only take care to chat in the right manner.



WHAT IS A CELL?

deposits	elephant	magnifying
material	separted	diagram
particles	existence	gradually
composed	pliant	structure
substance	examine	resemble

I am going to use the word "cell," in some of these Health Chats, and therefore, I will explain to you, at the outset, just what I mean by it; for if you do not get the right meaning of the word, you will very likely be thinking of a prison cell,—a hermit's cell,—or perhaps, of the waxen cell in which the honey-bee deposits its store of sweets.

First, I must tell you that the material of our bodies, and of every living thing,—plants

as well as animals,—is made up of a countless number of particles, each composed of a jelly-like substance, having within it the power to *live* and to *grow*.

These tiny particles are called “cells.” Sometimes the outer portion of a cell hardens into a thin covering or case, and this case is called a “cell-wall.”

It hardly seems possible that the great, clumsy body of an elephant began its growth with one little cell; or that a tiny insect, so small that you can scarcely see it with the naked eye, was even smaller still in its early cell-life!

We may say the same of the giant oak that spreads its leafy branches far and wide; and of the dainty wildflower that shyly hides itself away in the tall grasses at its roots.

Both tree and flower started out in life as a little cell, and so did every blade of the green grass that keeps company with them!

But how did a little cell grow to be a great elephant,—a tall tree,—a tiny insect,—or a dainty wildflower?

It was in this way:

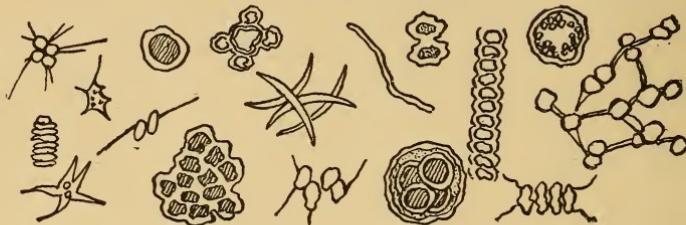
Each single cell grows and grows, and divides itself again and again; and each division, or new cell, grows and grows, and in turn, divides itself, until by and by, there is a great mass of them.

Sometimes the divided cells do not cling together in one mass, but remain separated, each by itself; then the animal or the plant,—as the case may be,—leads a one-celled existence.

But animals and plants of this sort belong to a very low order of life; for “In union there is strength,” you know; and a one-celled object does not rank very high in the world of growth.

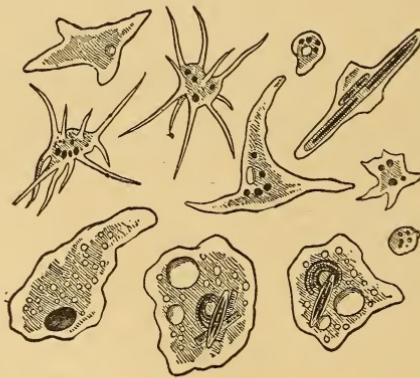
On the next page is a picture of a one-celled plant, showing first, the little cell, then

its division into two parts, and then the separation of the parts.



WATER ALGÆ (one celled plant.)

Here also is a picture of a one-celled animal that lives in fresh water; its cell-wall



AMOEBA (one celled animal.)

is very thin and so pliant that it may change its form with almost every move that it makes.

It is such a mite of an animal that you cannot examine it without the aid of a magnifying glass. In fact, it is so small that one drop of water is a *world* large enough for it to move in!

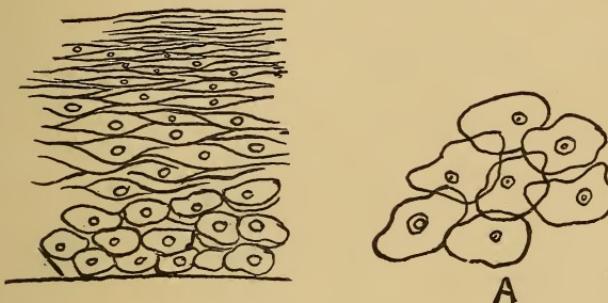


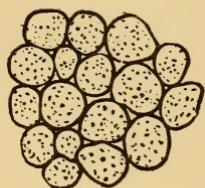
DIAGRAM OF VERTICAL SECTION OF THE SKIN.

A. Flattened scales, viewed from flat side. (Highly magnified.)

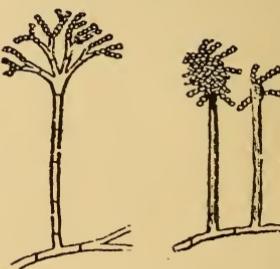
Here also is a diagram of the cell growth of the human skin; you will notice that the cells gradually change in shape, from the newly formed, almost round cells in the lowest layer, to the long, flattened cells at the top, or outer layer.

And now that we have a pretty fair idea

of what the word "cell" means, we shall be better able to understand how it is that these cell-masses form the material, or "tissue," as we call it, that composes the bodies of animals and of plants.



CELLULAR TISSUE.



CELLULAR PLANTS MAGNIFIED.

CURIOS WORKSHOPS.

PART I.

Physiology exclaimed stomach testimony
muscles supplied providing collecting
machines wholesome actually situated
machinery nourishment palate accidents

I have a young friend who has just commenced studying Physiology ; and yesterday, I invited him to dine with me.

When I asked him how he enjoyed the study, he replied that he liked it very well, only he found it rather hard at times, to remember some of the queer names of the different bones and muscles.

“ Ah, well,” I said, “ but you do not have to learn them all at once, you know.

“ You would not find it an easy thing to

remember the names of all the boys that you meet at school on the first day of the session, would you?"

He laughed at the idea of trying to do that; and so we chatted on, about the different things that he had been learning, till the bell rang for dinner.

As we took our places at the table, I said, "Now we will set all the machines in our workshops a-going."

He looked around in some surprise, and asked, "Where are they? What workshops do you mean?"

"If you were to visit that knitting mill that we see away on the hill yonder," I replied, "you would find that every piece of the machinery there has its own special work to do; needle, spindle and wheel, must each play its part; and yet no separate piece can do anything by itself; each must have the aid of the other.

"Now, these bodies of ours are something like busy workshops, and the different machines that keep them going are called organs.

"The names of some of these organs are hard to pronounce; but it is necessary to know them, in order to understand their use.

"You have already found that some of the names are easy enough to speak, as the heart, the brain, the liver, the lungs, and many others that you will learn as you go along.

"And now as we are about to begin our dinner, let us see which one of the machines in our workshops is to be set in motion first."

"Oh, I know," he exclaimed quickly, and as he spoke, he began to chew a mouthful of food, very slowly.

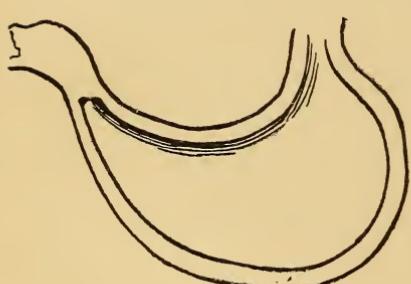
"That is right," said I; "give the grinding mill the first turn, and do not over-feed it nor work it too fast.

"If you chew your food slowly and well, you will need no drink to moisten it, nothing

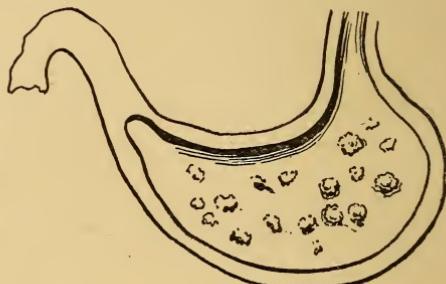
except what is supplied by the glands of your mouth."

As soon as I had finished speaking, he asked, "Why, then, do so many people drink tea and coffee with their meals?"

"Because they have formed the habit of doing so," I replied; "just as too many people have formed the habit of drinking wine, beer, whiskey and other poisons.



HEALTHY STOMACH.



UNHEALTHY STOMACH.

"I call these drinks poisons because they do not increase the strength of the body at all; on the contrary they tend to weaken it in every part.

"I have placed a glass of milk at your

plate, as you see; for it is not only a wholesome drink, but it is also a healthful kind of nourishment that may be taken into the stomach with every meal of the day.

" But it is not needed to moisten other foods that you eat; for the glands of your mouth will do that.



THE SALIVARY GLANDS.

P P', Parotid; *sm*, sub-maxillary. *d* is placed below the duct of the parotid.

" These glands are like small pouches or sacs; and they hold a constant supply of about three pounds of fluid a day; surely, such an amount as that ought to be quite enough to

moisten all the food that you need at each meal, providing you eat slowly so as to chew it well."

"But when one eats so slowly, it takes such a very long time," said my young friend.

"Very true," I replied, "but for what use, pray, were thirty-two sharp teeth given us?"

"I saw a man in a dining saloon of an ocean steamer not long ago, who ate in such haste, that he actually shovelled the food into his mouth with a knife!

"He scarcely took time to chew it at all; and in his eager haste to satisfy his appetite, he ran the knife so far into his mouth, that it did seem as if the soft palate was in some danger of being cut off!

"And with every mouthful of food that he ate, he took also a swallow of beer. Alas! his purple-red nose, his blood-shot eyes and his bloated face, all bore testimony to his manner of living.

" But to return to our workshops.

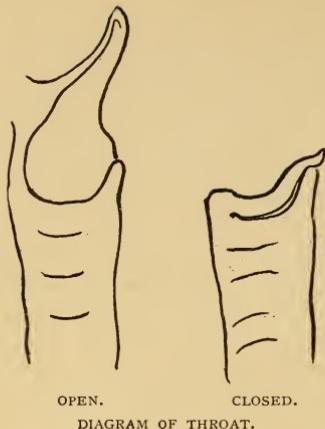
" When we have a mouthful of food well ground and properly moistened, what happens next?

" Your own tongue can answer that question, and you will not be obliged to put it into the form of words, either.

" Now take notice, and you will see that the tongue is busy in collecting all the food particles together into one mass, and very soon it will convey it to the back part of the mouth. What then?

" Then it will be thrust into a small funnel or tube, about four inches in length; and moving onward, it will pass into a larger tube, about nine inches in length, and then it will be emptied into the stomach.

" Right here, I must not forget to mention that there is a small trap-door in the throat, situated just behind the tongue; this little door quickly shuts down over a passage



that leads to the breathing-pipes, every time that a mouthful of food or of drink is swallowed.

“ But it sometimes happens that we attempt to swallow and to breathe at the same time, and this causes us to choke; because an atom of food tries to slip through the opening, and ‘goes the wrong way’ as we often express it.

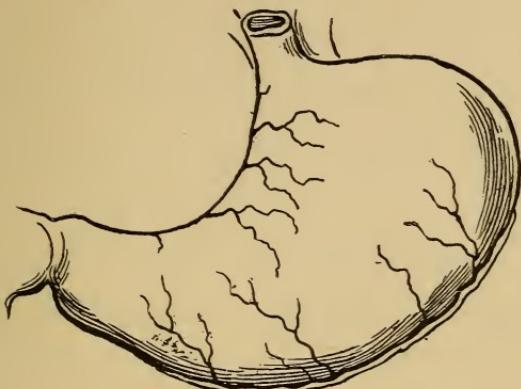
“ It is not only impolite, but it is also unsafe to talk or to laugh with the mouth full of food; and well-bred people will not do it.

“ We should always be careful to observe good table manners whether at home or abroad; and as long as we do this, we need have little fear of accidents in swallowing.

“ And now let us return to the point where we left the food after it reached the stomach.”

CURIOS WORKSHOPS.

PART II.



THE STOMACH.

busiest	inquired	special	thoroughly
abused	connected	instance	intestines
earnestly	process	gastric	pylorus

"The stomach is a strong bag that will hold three pints or more; it is one of the busiest workers in the body; but it is often abused, because it is made to do too much work at one time; this happens whenever we eat more food at a meal than we really need."

Here my young friend earnestly inquired, "Which machine is it that makes the blood

and sends it all through and through the body? I want to know about it; for I think it must be the most curious machine of all."

"It takes more than one machine to bring about all that," I replied; "for most of the food that we eat has a long way to travel,—perhaps a distance of thirty feet, before it finally becomes changed into blood; and each machine connected with the blood-making process has its own special task to perform.

"But we are coming to it now, step by step, and if you follow me carefully, you will soon discover that although every mouthful that we eat has to travel a long distance, and that it must pass through several little machines on its way, still the end is soon reached; and the very food that we are handling now, may soon become part of ourselves.

"For instance, some of the bread that you put into your mouth a moment ago, was

changed there by the fluid of the little glands that helped to moisten it."

"What, changed into real, red blood?" he exclaimed; and as he spoke, he quickly put out his tongue, as if he expected to see it look very much redder than when he began his meal; but in this he was mistaken; for the color of his tongue was about the same as before.

"No," said I, "not into red blood; but it was so changed that it was all prepared to pass down into the stomach, ready for use in the process of blood-making."

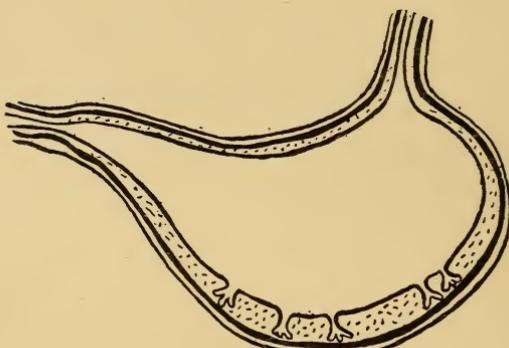
"And what becomes of the food that is not changed by the fluids of the mouth?"

"Oh, that is left for the glands of the stomach to prepare; these glands are always very active; they contain a strong, sharp acid, called gastric juice, a word that really means stomach-juice.

"Now, after food reaches the stomach, it

is rolled about and well-shaken, until it is thoroughly wetted with this strong acid; we sometimes say that food is *churned* in the stomach because it is kept in such constant motion there.

GULLET.



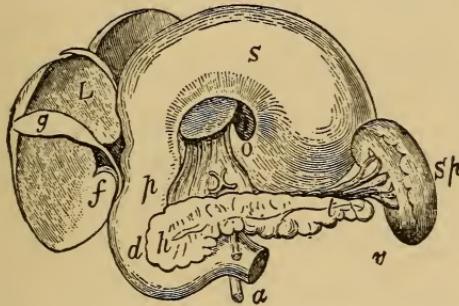
SECTION OF STOMACH.

Showing inside mucous coat containing gastric glands.

"Finally, when the portion of it which is ready to be used for blood-making is taken up through the thin walls of the vessels that hold the blood, it can no longer be called food, because it then becomes a part of the blood itself.

"There is still a portion remaining in the stomach, and this passes through an opening

into the upper part of the small intestine; called the pylorus (pi-lō-rūs.) This name comes from a word that means gate-keeper; and it is well-named; for no portion of food can pass through this opening that is not ready to leave the stomach.



PANCREAS AND SPLEEN.

The stomach is represented turned up, *S* being on its under surface. *f* indicates the junction of stomach and duodenum (*d*) at the pylorus. *O* is placed at the junction of stomach and gullet. *L* is on the right portion of the liver, which is also turned up to show *g*, the gall bladder. *f* is placed to the side of the common bile duct formed by ducts from the liver and gall-bladder. *h* is the pancreas, revealed by the turning up of the stomach. *Sp*, spleen. *v*, the part where blood-vessels are connected to the spleen. *v* and *a*, blood-vessels.

"As soon as it enters the intestine, it is acted upon by a very bitter fluid that comes from the liver; this fluid is called the bile; it is somewhat gluey, and is of a greenish-yellow color.

"But this is not all; there is another juice that mixes with the food here; and this juice comes from a gland called the sweetbread.

"The "sweetbread" (pān'-crē-as), is a long gland, shaped something like a dog's tongue, and is of a very light color. You will learn more about this gland, and the kind of fluid which it contains, in your text-book on Physiology.

"By this time, the whole mass is changed to the color of milk; and as it passes through the small intestine, it is sucked through the walls of a great many little tubes and becomes blood.

"So you will see that blood-making is a lengthy process that begins with the mouth and ends with the intestines."

"But how about the machines that send the blood through every part of the body?" he inquired.

"I will try to answer that question

another day," said I. "Come and see me next week; perhaps by that time you will have learned something about it from your Physiology, and we will talk the matter over together.

" You will not find many hard names to remember in studying about it; for although there is almost a countless number of blood vessels running in every direction through the body; it is only 'the larger and more important ones that we know by name.

" In case you are able to look the subject up for yourself, see if you come across any drain-pipes among the many blood-conductors that you find. I am hoping that you will be able to teach me something about these things when we meet again.



BLOOD VESSELS.

"But now does it not seem rather strange that the bread and meat which we are eating at this very moment is soon to become a part of our own bodies?

"And such perfect machinery withal. Do you not think it wonderful?" said I.

"Yes," replied my young friend, "it is indeed wonderful, and I have always liked to study about machinery; but I never knew before to-day, that I myself am a traveling machine-shop."

"That is not a bad idea," said I. "And now that you have the shop so near at hand, there is no good reason why you should not learn the workings of every part of it." He quite agreed with me in this, as I could see.

And so he left me to go on with his studies; and I am very sure that he will soon be able to master all the hard names that he may hereafter meet with in his text-book on Physiology.

INLETS AND OUTLETS.

discontented	opposite	chyle
pendulum	Switzerland	contact
complained	Geneva	impurities
equally	purple-hued	delicate
artery	partition	lymph

Did you ever read the story of "The Discontented Pendulum"? This pendulum complained that it had to keep swinging back and forth, day in and day out, without so much as once stopping to rest.

But upon looking into the matter, it was found that all the other parts of the clock were equally busy, each doing its own special work, in its own proper time; and thus it turned out that the pendulum did no more than its full, rightful share, after all.

Furthermore, it was discovered that this

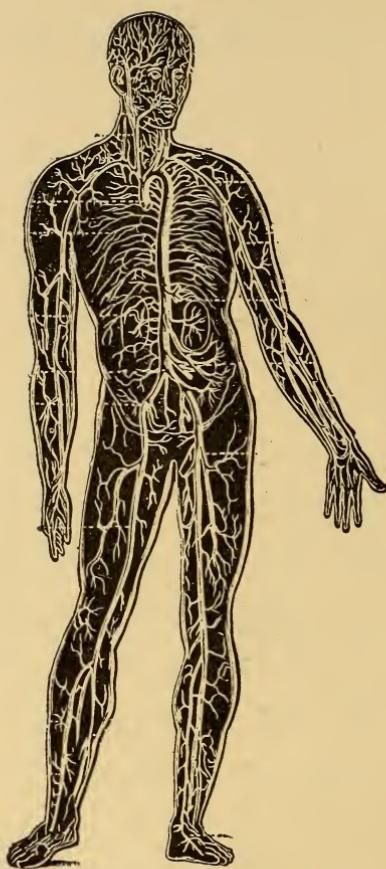


DIAGRAM OF THE BLOOD VESSELS.

foolish pendulum would not be able to swing at all, were it not for the help of all the other parts of the machinery!

So it is with these bodies of ours; each separate organ must receive help from all the others, in order to perform its own task well.



SECTION OF HAND — SHOWING ARTERY.

Place your finger upon your wrist, and you will feel a steady beat — beat — beat — which we call the “pulse”; this beating pulse

is a little wave of a small, red stream that flows through the arm.

The little channel through which this small stream flows is called an artery—a word that means “to contain air”; for it was supposed, many years ago, that it was the special work of such tubes to carry air through the body.

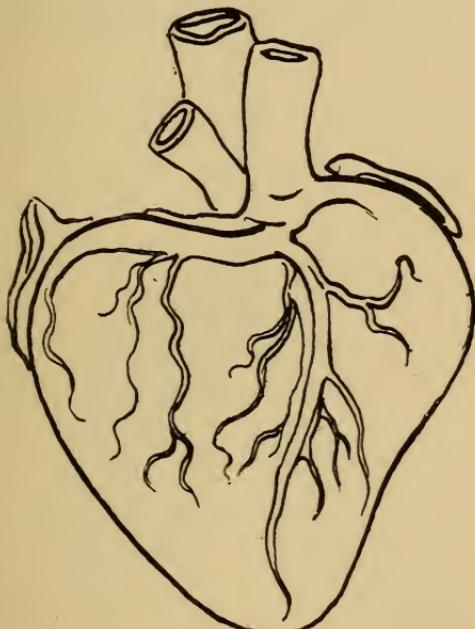
This little stream is only a branch of a much larger one that has its source or beginning at the left side of the heart, and which sends out so many branches that you would not find it possible to count them.

The arteries lie so deep beneath the skin that you cannot see them; but if you look at your wrist, near where you feel the beat of the pulse, you will see two or three blue veins.

These are the branches of a dark, purple stream that also flows through the arm; they are not filled with bright, red blood like the arteries; because it is their special work to carry

this kind of blood to the right side of the heart.

So we may say that the heart is like a small lake that has an inlet of dark, muddy



THE HEART.

water on one side, and an outlet of clear, pure water on the opposite side.

"But how can that be?" I hear you ask. Listen a moment.

I have seen a beautiful lake in Switzerland, through which a large river runs; when this river enters the lake, it is a dark and muddy stream; but when it flows out at the other side, it is almost as clear and as blue as the sky above it!

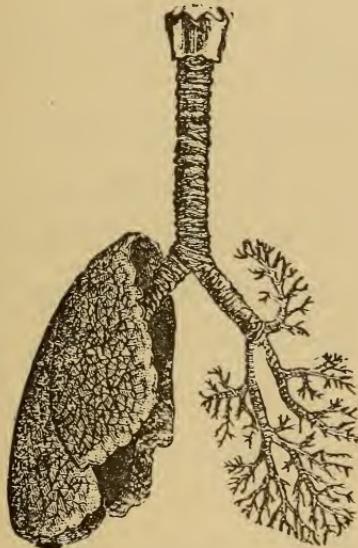
The lake of which I speak is that beautiful body of water known as Lake Geneva, and the stream that passes through it is called the River Rhone.

And now I will tell you how it is that the dark, purple-hued blood of the body which enters the right side of the heart comes out pure and bright again at the other side.

The heart has two strong helpers in bringing about this important change, and these helpers are the lungs.

The lungs are light, spongy organs, made up of a countless number of tiny sacs or cells, each separated from the other by a very thin wall, or partition, as we might say.

Now, the purple blood that flows in at the right side of the heart must pass through the lungs before it can flow out at the opposite side; and while passing through them, its color is changed to bright red.



WIND-PIPE AND AIR-TUBES — ONE SIDE COVERED BY LUNG.

“But how is it that the inlet of the heart happens to be made up of dark blood?” you inquire.

It is just this way:

The bright, red stream and its branches,

that lead from the left side of the heart, carry along with them material to build up every tissue of the body, such as the bones, the flesh, the skin, and so on; but while the blood vessels give something to the different tissues of the body, they also take something from them, in exchange.

But that which they take in exchange is no longer of any value in helping to form new tissues; and so it passes into the countless branches of that dark stream that finally empties into the right side of the heart; in fact, it is the useless, waste material of the tissues that gives to this same stream its dark, purplish color.

Now while this dark, impure blood is passing through the lungs, it is brought into contact with the air which is drawn in at every breath, through passages leading from the mouth and from the nose.

As soon as this happens, it loses the

greater portion of its impurities, and its purple color becomes changed to a bright red.

People sometimes find it easier to breathe through the mouth; but it is always safer to use the nose as a warming-tube, in drawing fresh air into the lungs; for the thin partitions between the lung-cells are very delicate and easily affected by cold air.

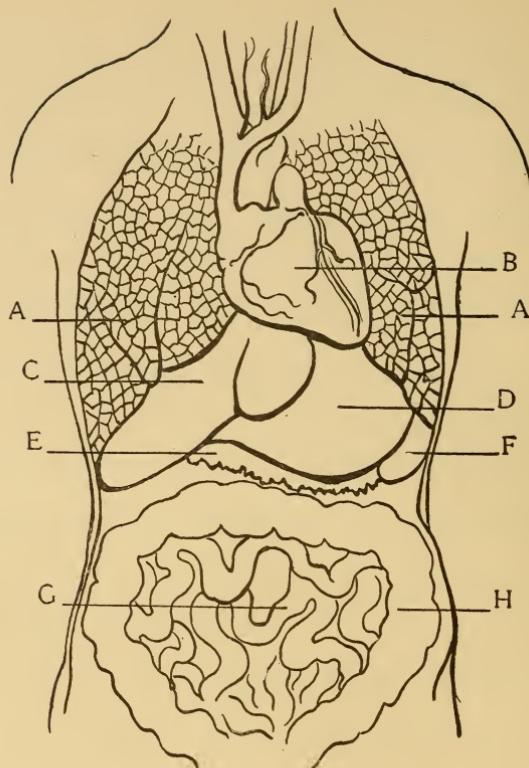
There is another tube, a sort of drain-pipe, we might call it, that carries blood from the liver to the dark colored inlet of the heart.

Can you tell me in what part of the body the liver is to be found?

"It is situated in the right side of the body," you reply.

That is correct; and if you look carefully at the diagram on the next page perhaps you can give me the names of some of the organs that lie near it.

Ah, you have found the "sweet-bread" (*páncreas*), a gland that helps to change food



A. LUNGS.	E. PANCRAS.
B. HEART.	F. SPLEEN.
C. LIVER.	G. SMALL INTESTINES.
D. STOMACH.	H. LARGE INTESTINES.

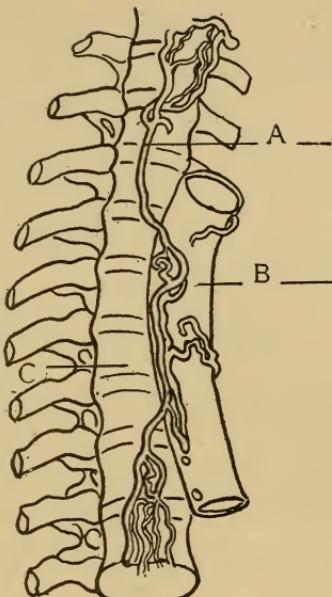
material into blood; and you have found another gland called the spleen.

But I am not wise enough to understand its use, because no one is wise enough to inform me!

The pancreas of the lower animals is called the "sweet-bread," and the spleen is called the "milt."

And now I must tell you of another set of tubes, aside from those already named, that also flow through and through the body in all directions. These tubes carry a thin fluid, called lymph (*limf*), which means like water; it is collected from different parts of the body, and is generally colorless, like water; but in the tubes of the intestines it is milky, and it is called chyle (*kile*).

The lymph-tubes are very numerous and the greater number of them lead to a larger tube that lies in front of the backbone; this



A. Lymph tube.
B. Duct.
C. Spine, or backbone.

tube is called a duct, and it opens into the large veins of the neck.

It is well supplied with valves, so that while its contents may be emptied into the veins, not a drop of blood in the veins can enter the duct.

These lymph-tubes may be regarded as the little economists of the body; for they take up substances of the worn-out tissues that are still of some value, and pour them into the veins to be used again; and all this helps to swell the purple stream that flows through the lungs to be purified.

If, then, we take good care of the lungs by feeding them with pure, fresh air, they will be the better prepared to do their special work well; and the dark inlet that passes *through* them, will finally become a bright, red outlet flowing *from* them, carrying health and strength to every part of the body.

LUNG FOOD.

PART I.

membrane	sentinels	sprinkling
glistening	resistance	clogged
purified	realize	smothered

You may wonder perhaps, why it is that the dark contents of the vein-tubes do not flow backwards while on their way to the heart.

The reason is this :

The thin membrane that lines the vein-tubes is folded, here and there, so as to form little pouches or sacs ; these tiny sacs are called valves ; and it is their special work to close up the vein-tubes and prevent a backward flow.

Most veins are provided with valves, and in the lower limbs they are very numerous ; for in standing and walking, the blood would

naturally flow downward if it were not for these little "trap-doors."

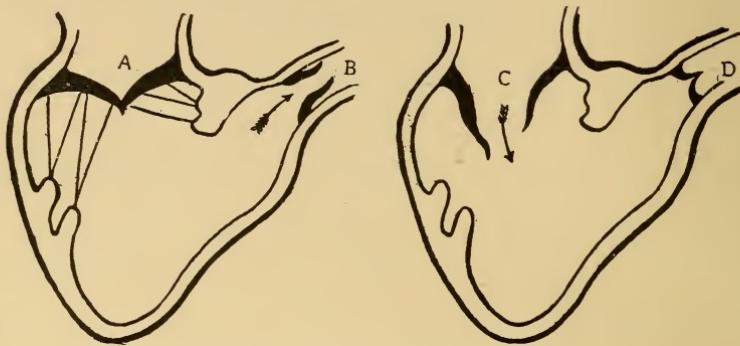


DIAGRAM OF THE HEART, SHOWING VALVES.

A, Valve closed. *B*, Valve open. *C*, Valve open. *D*, Valve closed.

There are also a number of valves in the heart, and some of them are fastened by white, glistening cords, to round, hard muscles that stand out from the walls of the heart. All these valves are very important; for the dark blood that goes to the lungs to be purified by the fresh air that they contain, must be kept moving along in its proper course; and when it leaves the lungs, pure and red, it must rush swiftly onward to the outlet of the heart.

So we may look upon these little valves

as watchful sentinels that never for a single moment neglect their duty; not one of them offers any resistance to the passage of the blood in its onward way, but as soon as it has passed them it is impossible for it to return by the same route.

Each little stream must make its own journey onward and onward through the different parts of the body; and this journey is made quickly.

It is not easy to say just how quickly, but it has been stated that the entire quantity of blood in the body passes through the heart every two minutes; or perhaps in a little less time than that.

The arteries have no valves excepting those that guard their openings within the heart; for they do not need them elsewhere; but as I have before stated, valves act as faithful sentinels, wherever they are placed, to prevent a backward flow (of the blood.)

Busy workers indeed are all the blood vessels, the heart and the lungs, and how few of us realize the vast amount of labor that is daily performed by them.

There are only sixty seconds in a minute, and one cannot expect to do very much work in so short a space of time as that ; and yet if you draw in a full breath, and try to hold it for one minute, how long the time does seem to you !

Now it has been proved that a person breathes as often as eighteen times a minute. Would you have believed that your lungs are working away at such a rapid rate as that ?

But this is not all ; for if you were obliged to count every throb of the pulse,—which in grown-up people is something over seventy times a minute,—you would discover that the heart actually beats one hundred thousand times in twenty-four hours !

That is a large number to count, and I am

afraid that some of us would fall asleep before reaching the end! But since the lungs are fed with air as often as eighteen times a minute, should we not be very careful to supply them with food of the proper quality?

Many people do not know the value of pure, fresh air; because they do not know that very soon after it is drawn into the lungs it becomes a part of their own bodies.

Let me explain:

We take food into the stomach, in order to live; but we must also draw air into the lungs in order to live; if we eat poison food we are very likely to die; if we breathe impure air, although we may not die at once, yet it will tend to shorten our lives.

Good blood feeds the body and makes it strong and active; and good blood is made up of pure air, and of wholesome food and drink.

If we shut ourselves up in a close room

at night, and breathe over and over again the air within it, we take poison into the lungs.

A bedroom should be large enough to admit plenty of fresh air; and it should also be provided with an opening, through which impure air may escape.

Air is necessary to the life of all animals; even fish, that are found in the deepest waters, draw in more or less air through their gills; for there is always a good deal of air in a body of water, otherwise no animal could live in it.

In fact, every living thing, plants as well as animals, must have air, in order to live. Animals are furnished either with lungs, gills or breathing pores; and even plants breathe through the tiny pores of their stems and leaves.

“But what is this air that we cannot live without? Of what is it made?” some one inquires. Let us find an answer to this question.

LUNG FOOD.

PART II.

oxygen	brilliant	exception
nitrogen	crystallized	graphite
carbonic acid	co-partnership	ventilating
combined	over-taxed	occupies
proportion	consumed	supplies

There is a certain gas called oxygen (*öks-i-jĕn*), and another that is called nitrogen (*ni-trō-jĕn*), and still another called carbonic acid gas; and these three gases form the air that we breathe.

Now we cannot see either of these gases, any more than we can see the air. How do we know, then, that all this is so?

We know it, because persons who have made a study of it, have learned how to separate these gases, one from another; and

they have found out also that carbonic acid gas is composed of oxygen and of carbon, combined in certain proportions.

What is carbon? It is a substance that abounds in many forms. All kinds of coal contain carbon. The substance of your pencil that you call "black lead" is carbon; but it is not black lead, at all, it is graphite, a name that comes from a word which means "to write."

I must tell you also that all real diamonds are carbon. What! such brilliant gems as diamonds? Yes, these are but crystallized forms of carbon. How very strange that coarse, common coal and costly diamonds should be made of the same material!

But how is it that a piece of hard coal, which we can both see and feel, can be changed to a thin gas that we are not able to see at all? It is in this way:

When carbon burns, it forms so close a

union with oxygen that it is no longer a solid substance; they have become a gas — carbonic acid gas.

But I must tell you, right here, that neither oxygen nor nitrogen are formed in this way; for they are simple gases — that is, they are not composed of other substances.

Now oxygen is the only gas that will promote animal life; but it would be too strong, in itself, and it is the office of the nitrogen to lessen its force; in fact, there are four parts of nitrogen to one part of oxygen in the air.

Besides these three gases, there is always some water in the air, and we add more or less to it, with every breath that we draw. What! is our breath laden with moisture? Hold a small mirror to your mouth, and you will see!

I should have told you before, perhaps, that the lungs, the skin and the kidneys form a strong co-partnership in freeing the blood

from the impure water which it contains; and when one of these partners fails to do its rightful share of the work, the other two are over-taxed.

The breath of the animal creation gives out, also, a good deal of the carbonic acid gas of the air.

This is a very heavy gas, and is, therefore, often found at the bottom of deep wells, and in caves; a lighted candle will go out if put in such places, because where there is no oxygen, nothing can burn.

Wood, coal, chalk, shells of mollusks, and in fact, everything that contains carbon, will burn quite readily, excepting the diamond and graphite; they will burn only under certain conditions.

As I said before, there can be no life where there is no oxygen. I once visited a deep cave in Italy, in which carbonic acid gas had collected in large quantities; but being

heavy, it lay upon the floor of the cave, where I was in no danger of breathing it.

My guide took with him a large rat, which he threw down upon the floor, at a little distance from the mouth of the cave. The poor animal tried to make its escape, but it was soon overcome by the gas, and died before it could reach the opening.

So when we close all our windows and doors at night, we not only shut out our good friend oxygen, but we also draw back into the lungs some of the carbonic acid gas that has been once thrown out of them.

Care should be taken, however, in ventilating a bedroom, not to allow the outside air to pass directly over the bed, as this exposes the person who occupies it to the risk of taking cold; many a severe illness has been brought about in this way.

Now, strange to say, this carbonic acid gas, so injurious to the animal creation, gives

health and life to the vegetable creation, for carbon is the food of plants.

The green coloring of the vegetable world, by the help of the sunshine, is able to take carbonic acid gas out of the air for the support of plant life.

Think of it! The great golden sun, "the king of day," away up in the sky, sends down a countless number of shining sunbeams to help a tiny blade of grass feed itself! And from below, good Mother Earth supplies its slender roots with drink!

But does the plant world take no oxygen from the air at all, and is it always taking in carbonic acid gas?

Let us see:

A certain supply of air is constantly finding its way through the thin cell-walls of a plant; in other words, the plant breathes, and also feeds, by means of its tiny pores.

But it is better able to separate the

carbon from the oxygen under the influence of light; and it will do this under any strong light, such as an electric light or a gas light.

During the day, therefore, plants take more carbonic acid gas from the air than they can during the night.

But on the whole, the plant world is very helpful to us in purifying the air; for it yields up to us much of the life supporting oxygen which we so greatly need, and takes, in exchange, much of the poisonous carbonic acid gas which we do not need at all.

The verdant grass on which we lightly tread,
The tiny leaf that flutters on the tree,
The dainty flower that droops its modest head,
Each yields a breath of health to you and me!

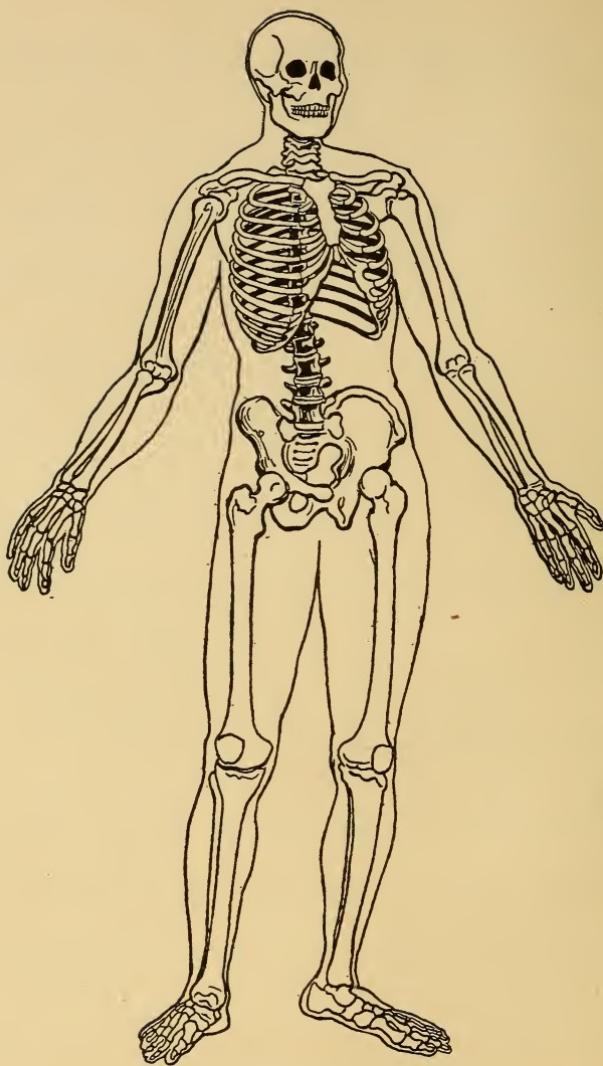


DIAGRAM OF FRAMEWORK OF THE BODY.

A STRONG FRAMEWORK.

PART I.

museum	Cologne	Anglo-Saxon
musical	Ursula	Britains
instrument	decorated	fibula
tibia	embroidered	femur
awkward	constructed	comfortable

I once saw, in a museum, a very old, musical instrument that looked something like a flute. It was a choice relic, and was carefully kept in a glass case so that no one could touch it.

I learned that it was called a Tibia (*Tib'-i-a*), and that it was so named because it had been made of the bone of an animal's leg. It seems a little odd that the leg of an animal can be turned into a musical pipe, does it not? And yet since all the long bones of an

animal's body are hollow, it ought to be quite an easy thing to do, after all.

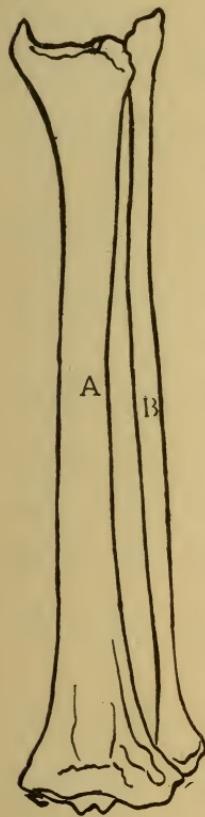
But I can tell you something far more strange than that about the use of the bones; and I may as well tell you right here.

There is a large church in the City of Cologne (Kō-lōn), called the church of St. Ursula, (Ur'-sū-la). This church is decorated with the bones of eleven thousand human skeletons!

The skulls of some of these skeletons are covered with velvet caps, embroidered with gold; while many other parts of the body, such as the bones of the fingers and of the toes, are encased in silver caskets, and in tubes of crystal, adorned with gold, silver and precious stones.

It is recorded that St. Ursula, and her female companions, several thousands in all, had fled from Britain to escape from their Anglo-Saxon enemies. They took refuge in a

convent at Cologne; but here they were no safer than before, for in the year 451, a terrible army of Huns fell upon the city, and cruelly murdered men, women and children; and St. Ursula and her companions were among the slain. If you will read the history of the Britains, at that period, you can learn more about it than I have time to tell you here.



A. Tibia. B. Fibula.

Now as soon as I saw that old flute in the museum, I remembered that there is a bone of this kind in the human body, upon the inner side of the leg. It is the strongest bone below the knee, and it is often called the "shin-bone"; and fastened to the side of it, is a bone that is somewhat similar, named the Fibula (*Fib'-ū-la*), a word that means a clasp or a buckle.

It is not necessary for you to learn, at this time, the names of the different bones in the body; for there are over two hundred of them in all; and some of the names are very hard to pronounce; so we will learn the name of only one more, to-day, and that is the Femur (*Fē-mur*), a word that means the thigh.

This femur, or thigh bone, is the longest, and the strongest bone in the body; and it is made fast to the bone of the hip, by a large joint.

Now it would seem that with three good-sized bones in each of the legs, one ought to be able to stand, to walk, or to run, with the greatest possible ease.

But I know a boy who shuffles along the street in a most awkward manner, so that with every step that he takes his knees turn outward.

I am sorry to say that some of his school-fellows are so rude, and so unkind, as to run

after him, and call him "Bow-legs." I am very sure that they would not do this, if they were to stop and consider for a moment that this poor boy is in no way to blame for his manner of walking.

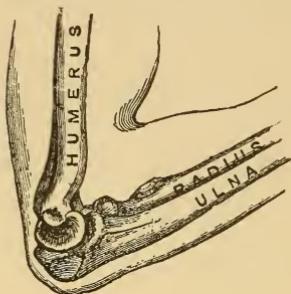
"But why should he walk in such an odd way?" I hear you ask.

There may be more causes than one for it; but it is quite likely that when he was a baby, he was taught to stand alone, and to walk, before his legs were strong enough to bear the weight of his body; in this way, both the tibia and the fibula were badly bent, and his legs became "crooked."

The bones contain lime, and also some animal matter; the limy part makes them hard and firm; and the animal part helps to make them strong and tough; but both parts are needed to keep them from being too easily bent, or too readily broken.

When we are young, there is more

animal matter than lime in the bones; and that is why the legs of little children so quickly bend beneath their own weight.



SECTION OF ARM.

As there are three strong bones in each leg, so there are also three in each arm, one above the elbow, and two below it; besides these, there are many smaller ones in the wrist,

the hand and the fingers.

I saw a very old man, to-day, who had his arm done up in a linen bandage, called a "sling"; he had fallen on the side-walk and had broken his wrist. The bones of an old person contain more lime than animal matter, and so they are more easily broken than children's.

But with thirty bones in each arm, and as many more in each leg, to say nothing of those to be found in other parts of the body,

the only wonder is, that so many of us go through life with our bony framework safe and sound!

Are we all sitting erect, at this moment? If not, let us try to do so, for I am quite sure that none of us want to become "round-shouldered," do we?

You and I have often seen boys and girls bending the body forward, both when sitting and when walking; but the back-bone or spine of the body is in no way at fault because of this; for it is constructed in such a fashion that it can be kept upright all the time, if we desire it.

There are twenty-four bones in the spine, and they are so well separated by small pads, that they can move freely, without rubbing against one another at all, no matter whether the body bends backward or forward, or from side to side; but some people seem to think that it is more comfortable both to sit and

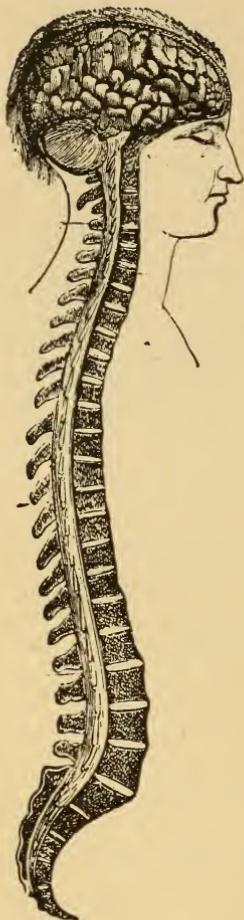


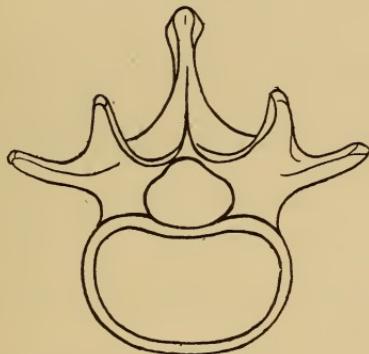
DIAGRAM OF SPINE.

to walk in a stooping position, and they do this until the spine becomes so badly curved that it cannot regain its natural position.

In some cases of injury to the spine, a stiff, hard jacket, made of plaster of Paris, must be worn next to the body, in order to keep it erect. There is nothing but a layer of flannel between this hard jacket and the skin, and you may well suppose that it is a very uncomfortable jacket to wear.

I have seen little children in hospitals encased in such jackets, and they were pitiful objects to behold. This weakness of the spine often comes from a disease of the bones or of some other parts of the body.

But it is frequently caused by a lack of nourishment, necessary to the health and growth of the bones; for the body must be supplied with the right kind of food, in order to build up a strong framework; but we will talk more about this, hereafter.



VERTEBRAE — SECTION OF BACKBONE.

A STRONG FRAME-WORK.

PART II.

requires	cigarettes	offensive
Austria	possessed	nicotine
strapped	appearance	frightened
gymnastic	disagreeable	dwarfed

It requires but little care on our part to keep the body erect through life, even should we live to extreme old age.

I have seen women in Austria, bearing heavy wooden boxes strapped on their backs; and these boxes were not empty, by any means; on the contrary they were loaded to the very top with moist sand.

Such women are called "sand-bearers," because it is their business to carry sand to the stone-masons, who work it into mortar, for the walls of houses and other buildings.

You might suppose that these women would soon become "stoop-shouldered," on account of the hard labor that they perform every day of the week ; but not so ; for just so soon as their burden is removed, they throw back their shoulders and stand up as erect as possible, till the boxes are emptied and strapped to their backs again.

This is all the gymnastic practice that these poor women ever have the time to take ; but they make better use of the few minutes thus given them, than do many boys and girls that I know, who receive a careful drill in this important exercise, every school-day of the year.

I have a young friend who ought to be almost as tall again as he is ; but when he walks on the street, he looks like a feeble, old man, bent with age, although he is but eighteen years old.

Why is it that he is such a dwarf ? The truth of the matter is this :

When he was a small boy, he formed the habit of smoking tobacco, first in the form of cigarettes, then in cigars, and finally in clay-pipes; and this stopped his growth.

He is truly sorry for it now; because he would like to have a tall, straight, manly form, such as he might have possessed if he had not weakened his body with tobacco.

But it is not the framework of the body alone that is injured by this poisonous weed; it is harmful in many other ways.

It dims the sight, it deafens the hearing, it dulls the sense of taste and of smell, it defiles the breath, and very often it so weakens the mind as to destroy the memory.

Besides all this, it is a well-known fact that persons who have formed the tobacco habit, are apt to become very untidy in their appearance; and their garments are usually so strongly scented with it, that other persons find it really disagreeable to occupy a position near

them for any length of time; and yet they are so used to this vile odor, that they never think for a moment that it can be offensive to anybody else!

Not very long ago, I saw two boys on the street who were just learning to smoke. They had picked up some cigar-stumps, on their way, which were filled with this poison, called nicotine, (nik-o-teen), an oily substance that is always found in the tobacco plant.

One of these boys soon became very ill, so that his companion had to help him to a seat on the curb-stone. As he grew worse, he seemed to be a great deal frightened about himself; but he would have been much more so, had he known as I did, that he had just taken into his system an active poison, and that it was only beginning to do its work.

He was a tall, straight, fine-looking lad, and I trust that as it was his first attempt at smoking, it may be his last; for should he

persist in trying to form the habit, he will doubtless be dwarfed in his growth; and besides this, he will be very apt to suffer in other ways, both in body and in mind.



A STRONG FRAME-WORK.

PART III.

explained	limpsy	bunions
region	companions	satisfied
dissolving	acquaintance	interferes
enlargement	pressure	alcoholic

“ Uncle Ben ” is an old man who spends a good deal of his time walking about in the forests and in the fields. He tells me that he can learn more in that way than he could ever learn at school !

One day he said to me, “ Do you know that you are part of a rock ? ”

“ How can that be ? ” I replied ; and then he explained it in this way :

“ The food that we eat and the water that we drink, both contain more or less mineral matter ; and this being the case, we cannot help

taking into our stomachs daily, some portion of the material of which rocks are formed."

We have already learned that the bones contain lime; and many of us know that the most common kind of rock is called limestone; but common as it is, there are some forms of it that are very rare and of high value.

The beautiful marble vase that stands upon your parlor table was made of a certain kind of limestone; and the pretty, tinted shells that you pick up along the seashore are made of it; and so are the shells of the crab, of the lobster, of the snail, the oyster and the clam.

These animals take lime into their stomachs with their food and drink, the same as we do; and afterwards they use it in building their shells. You can learn all about that in your book of Natural History.

Do you know what "hard" water is? I will tell you.

When a river, or any other body of water

is fed by streams that flow through a limestone region, the water is said to be hard ; " because these small streams bring to it limy matter which they gather on their way by dissolving some of the limestone. So when we drink hard water we drink more or less lime with it.

A piece of soap dropped into a dish of hard water will change it somewhat to a milky color ; but it will not have the same effect upon rain-water, because that has no lime in it, and so we speak of it as " soft water."

The shell-fish would be poor, naked things without their limestone houses ; and what weak, limpsy creatures we would be, without our strong, limestone frame-work to support us !

Why, we would be no more able to hold ourselves erect, nor to stand alone, than little Miss Primrose, and her companions, whose acquaintance we made in the first chapter of this book.

But strong and firm as the bones may be,

they will not stand too much pressure. Now let me tell you something:

I happened to step into a shoe-store not long ago, and I saw there a young lady trying to squeeze her foot into a dainty kid shoe, that was at least one size too small for her.



The shoe-dealer said, "Would you not like to try a size larger, Miss?" "Oh, no," was the reply, "these shoes will be all right when they are broken in."

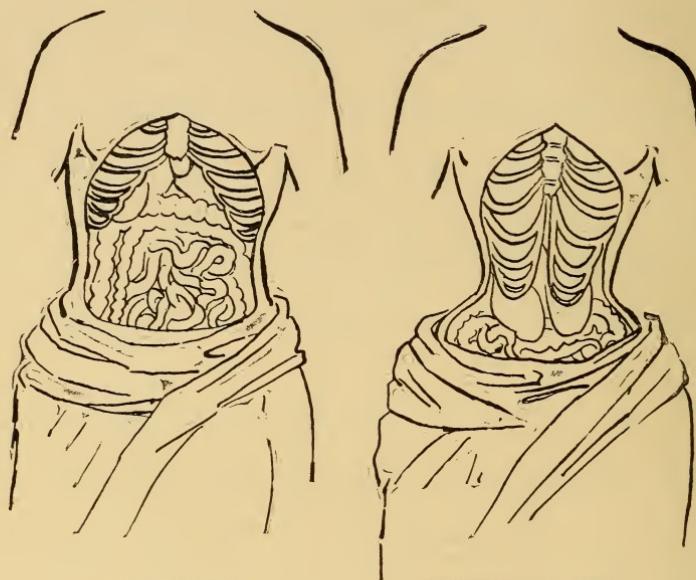
I can well imagine the red, swollen joints of the great toes, called "bunions," and the hard, thickened skin called, upon the smaller toes, "corns," to say nothing of the painful in-growing nails of perhaps all the toes, after the young lady has her shoes well "broken in."

How it will spoil her gait too, as she goes limping along, at every step! And all because she believes that her foot looks prettier for being crowded into a space that is much too small for it.

I am sorry to say that there are a good many well-informed people who are not satisfied with the size of their bodies as nature has made them; and so they use tight corsets to compress their ribs, in order to make the waist look smaller. Now this greatly interferes with the action of the heart and the lungs, and often crowds both the stomach and the liver out of their proper places.

Ah, but it is not right to abuse the fine

frame-work of our body in this way; on the contrary, we ought to take great pains to keep it in good condition.



NATURAL BODY.

DEFORMED BY LACING.

And what can we do to keep it in good condition? Let us see.

Both the food and the drink that we consume every day have much to do concerning this. Those who have made a study of the laws of health, agree that brown bread and

milk form a wholesome food, because they both contain good material for the bones as well as for all other parts of the body.

Brown bread is made of flour from which the bran has not been sifted; this bran is composed of the coats of wheat kernels, and it contains a good amount of animal matter.

White bread is very nice to look at, and it may be tempting to the appetite; but it is not nearly as wholesome as the bread that is made of darker flour.

Milk alone is full of nourishment, and it has been proven that a person can live on it for a much longer time, than upon any other single kind of food.

But there is no such nourishment to be found in any form of alcoholic drink, such as wine, whiskey, brandy, beer and liquids of that sort; all such drinks are harmful to every part of the body; like tobacco, they poison the blood, and thus tend to shorten life.

There are many kinds of food besides bread and milk that furnish the body with mineral matter. We obtain some from the flesh of animals, and even from the garden vegetables that are placed upon our tables every day. How is that possible? I will explain:

Many of the lower animals, as the ox, the cow, and the sheep take a quantity of mineral substance into their stomachs with their food and drink; so also the roots of vegetables suck up sap from the earth; and in this way, they, too, are fed with mineral matter; and that is how we obtain bone material from both animal and vegetable food.

So it turns out that "Uncle Ben" was right, after all, only he might have gone still farther, and said that the whole creation is in part, a rock!

YOUR HOUSE AND MINE.

PART I.

connected	comparison	muscular
encloses	arranged	especially
protects	balance	temperate
fibers	pastries	healthful
connective	constant	digestive

Almost every child has heard the old nursery story of "The House that Jack built." It runs something in this way:

"This is the house that Jack built; this is the malt that lay in the house that Jack built; this is the rat that ate the malt that lay in the house that Jack built."

And so it goes on to tell about the cat and the dog and many other things connected with the house that Jack built.

Now I can prove to you, that your house

and mine are more wonderful than even the famous house of the nursery story.

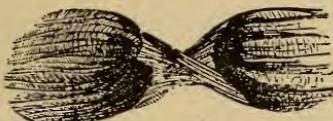
We have learned something of the framework of the body, and of the different organs connected with it, and now we will talk for a little while about the thick covering that encloses and protects it.

When I was a child, I used to visit an old lady who earned her living by weaving rag carpets for her neighbors. She had a large, wooden loom in her house, and there she sat, day after day, working busily at her trade.

The threads of the warp were wound over a beam; while the woof or "filling" as she called it, was wound upon a wooden holder called a "shuttle;" and when she was at work, how that shuttle would fly back and forth through the threads of her warp! It was a pleasure to watch it.

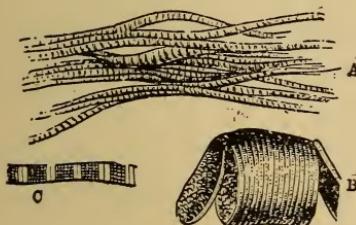
Now if you will take a piece of lean beef that has not been very well boiled, and care-

fully pull it apart, you will see that it is made up of small threads, placed close together, side by side.



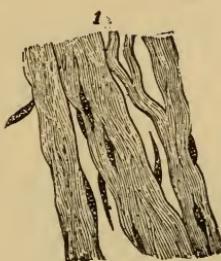
MUSCULAR FIBER WITH ITS SHEATH.

These threads are called fibers, (fi-bers), and they are held in place by still finer threads which you cannot so well see, for the reason that they are easily dissolved in the process of

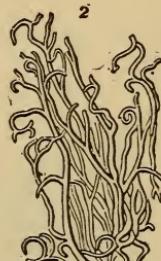


MUSCULAR FIBER SEPARATED.

A into fibers and B into discs. C is a highly magnified portion of a fiber.



Fibers of (1) White Fibrous, and (2) Yellow Elastic Tissue.



boiling; these finer threads form what is called "connective tissue," because they connect or hold the coarser fibers in place.

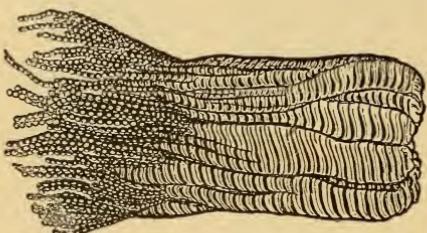
This tissue is found in every organ of the

body; in fact, it holds the different parts of the body together; and when boiled, it is sticky like glue.

The next time that you eat a piece of boiled meat, I am quite sure that you will notice this soft, clear jelly-like substance, between the layers of the muscle.

So it is that the meat-tissue or flesh substance which covers the bones is made up of two kinds of fibers or threads.

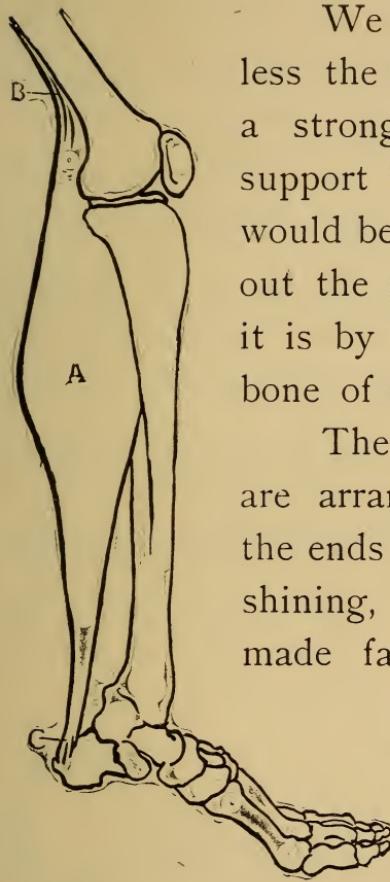
The fine, thin fibers may be likened to the warp, and the coarser ones to the woof, or "filling," as we may say; but here our com-



MUSCLE FIBERS.

parison must end; for the threads of the loom can neither lengthen nor shorten themselves, while the

flesh-fibers of the muscles can do both. Here is a picture of a bundle of fibers, showing the little cells of which each fiber is composed.



LARGE MUSCLE AND BONES OF THE LEG.

A, Muscle. B C, Places where muscle is joined to the bones.

We already know how helpless the body would be without a strong bony framework to support it; but this framework would be quite as helpless without the aid of the muscles; for it is by their force that every bone of the body is moved.

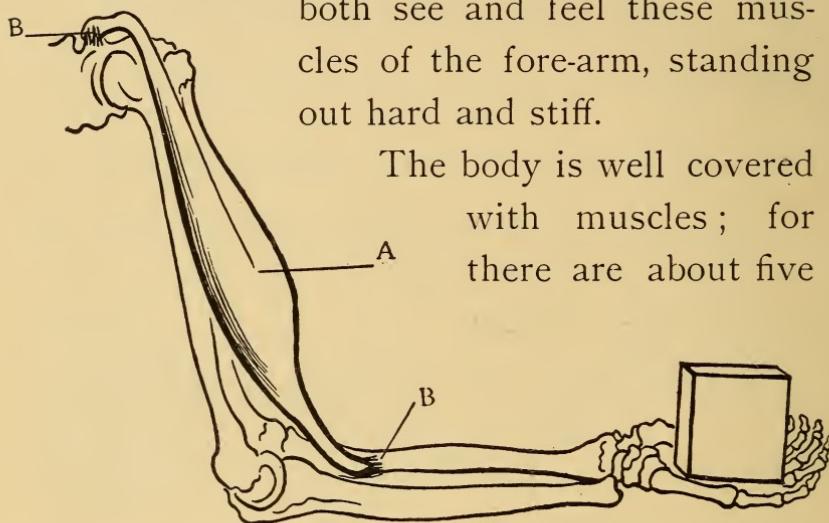
The fibers of the muscles are arranged in little bundles, the ends of which terminate in shining, white cords that are made fast to the bones; and were it not for the help of these muscles, we would be quite unable to hold our bodies erect, to walk, or to run.

For example, when you stand up straight, the fibers of one set of muscles shorten, while

those of another set lengthen, and in this way, they balance one another, and thus keep the body from falling forward.

Again, to bend your elbow, the muscles, in the back part of the arm above the elbow, lengthen, while those of the fore-arm shorten ; and, if you shut your hand tightly, you can both see and feel these muscles of the fore-arm, standing out hard and stiff.

The body is well covered with muscles ; for there are about five



LARGE MUSCLE AND BONES OF THE ARM.

A, Muscle B B, Places where muscle is joined to the bone.

hundred in all ; and it is very important that we know how to take care of them. Pure air,

wholesome food, and a proper amount of exercise are as needful for muscles as for bone.

Rich pastries, strong drink, tobacco and opium are harmful to the muscles because they are harmful to the blood upon which the muscles feed. A constant use of tobacco often causes the muscles of the hands to tremble and shake, as with old age.

I know a man called "Fat Joe" who weighs nearly three hundred pounds; and when he walks upon the street, people stop to look at him, because he "waddles" along, in such a queer fashion.

The fact is, this man has a strong appetite for beer; and he has taken so much of it into his system that he has gained *too much* useless fat, and *too little useful muscle*; for beer and other alcoholic drinks tend to change muscular tissue into fat.

This fat tissue does not help him to exercise his limbs at all; on the contrary, it is a

burden of which he would gladly free himself. His condition might be improved, however, if he would observe the following rules:—Exercise briskly every day,—live upon a spare diet,—and avoid taking much fluid of any kind into the stomach, and especially at meal-time.

I would not have you suppose that all “fat” people are the victims of alcoholic drinks; for sometimes the most temperate persons gain fatty tissue at a rapid rate; but those who understand the laws of health may guard themselves against becoming too fat, by carefully observing the rules already given.

Exercise is the best means of gaining muscular strength; and as a general thing; boys and girls get a good share of it in their out-door sports; but there is, here and there, a child who prefers to sit, poring over the pages of a story-book from morning until night.

Such boys and girls may generally be known by their thin, pale faces, and slender,

feeble bodies; and they seldom grow to be strong men and women.

"What kind of exercise is the most healthful?" I hear some one ask.

Almost any form of exercise is good that calls you out into the open air where you can get plenty of sunshine. I do not mean by this, that you are always to play in the hot sunshine; for too much of it might give you a headache; but we "human plants" are something like flowers, we cannot grow and thrive where there is too much shade.

Most children are so fond of out-door games that they often carry their sport to an excess. To get over-tired, again and again, wears out muscular tissue faster than it can be built up. "Stop before you are tired," is a good rule to follow.

You should also be careful to avoid taking much active exercise either just before or just after a hearty meal; because this interferes

with the digestive work that is being carried on in the stomach ; and good digestion makes good blood, you know.

In every form of exercise, loose clothing should be worn, so that both the bones and the muscles may have free play.



HEAD OF APOLLO BELVIDERE.

YOUR HOUSE AND MINE.

PART II.

somersaults	exhausted	gondola
tourists	pastime	porpoises
pirouette	venture	messengers
encourage	Venice	viloently

I have said that almost any form of exercise is good that calls you out into the open air; but there are some ways of using the muscles violently that I would not advise you to practice. Let me explain.

I have seen boys in the mountains of Scotland, turning somersaults alongside a carriage full of tourists, and walking upon their hands, with head downward and with heels in the air.

Sometimes they would make long leaps and with every leap, they would cry out

“ Pirouette ! ” “ Pirouette ! ” (pir-oo-et), meaning by this, “ See me whirl ! See me dance ! ”

Then some one would encourage them by throwing a penny into the road, as a reward for their feats; and the boys would follow the carriage, for a long distance in this way, until they became perfectly exhausted.

Such violent exercise as this is both unsafe and unnatural; it often brings on a severe attack of bleeding at the nose, because it greatly disturbs the action of the heart and of the blood vessels.

When walking, for the express purpose of taking exercise, it is a good plan to swing the arms as you walk, so as to bring as many muscles as possible into action ; but it is not a graceful thing to do in the street, nor in the house.

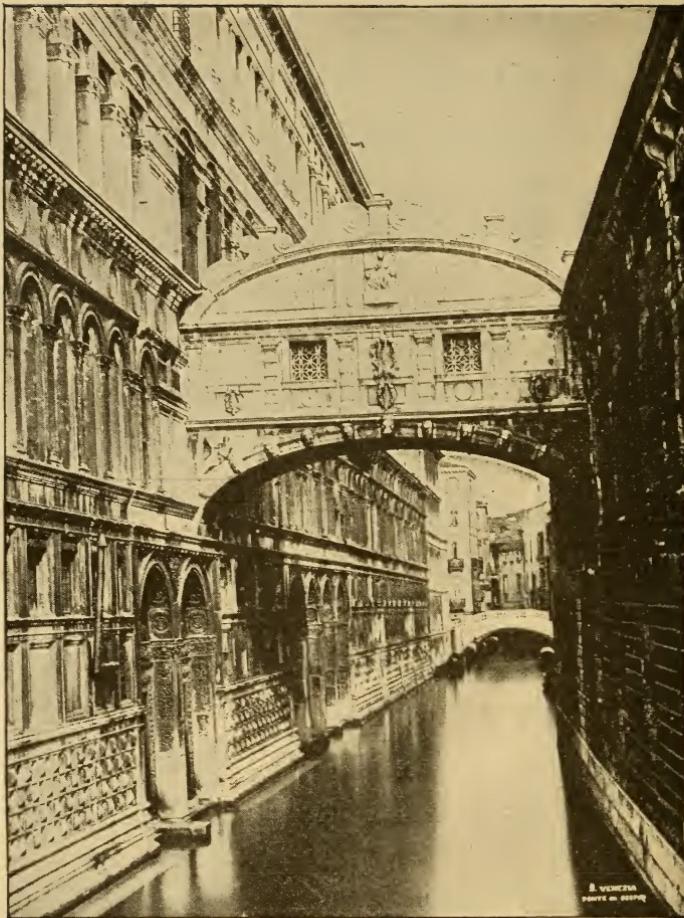
I like to see a class of pupils file in and out of the schoolroom to the sound of music, keeping step with the time as they march ; but I

have seen both girls and boys marching along in this way, swinging their arms back and forth like wood-choppers in a forest!

All exercise connected with gymnastics is helpful to the growth of the muscles, and may be considered the next best thing to out-door sports.

Skating is a pleasant pastime; but there is often some danger connected with it, especially where the water is deep. Rowing is a fine exercise, as it brings into action not only a large number of muscles, but many of the bones and joints of the body, as well; however, even this must not be carried to an extreme.

And how about swimming? The boys can testify that every muscle of the body must play its part in the water; but I am sorry to say that they sometimes forget themselves, and remain in the water too long; if this happens very often, the body is weakened, and perhaps some disease may follow that will prove fatal.



SCENE IN VENICE.

Then too, boys are apt to venture beyond their depth ; and even the best swimmers are sometimes seized with " cramps " in the lower limbs ; and in this condition, where the water is very deep, they are unable to help themselves.

However, it is a fine thing to know how to swim, and with a proper amount of caution it is a safe and healthful form of exercise, for girls as well as for boys.

I must tell you, right here about some little swimmers I once saw in Venice.

Many of the streets in Venice are nothing but " water-ways " or canals as they are called. The houses are built along the edge of these canals, with steps leading down to the water.

There are bridges here and there over the canals, connecting narrow streets, in which people may walk if they choose ; but when they wish to ride, they must take a water-carriage or boat, called a gondola ; for there are no horses in that city !

Now it is necessary for every child in Venice to know how to swim, as you may well suppose; and as soon as the little ones are able to walk, they have to learn; and this is how it is done:

The mother ties a strong rope around the waist of her infant, and keeping hold of one end of the rope, she throws her child into the water. The little creature struggles, and strangles and cries until the mother pulls in the rope.

This is repeated again and again, till the child is as well able to swim as a fish, and he likes it, too.

I have seen these baby swimmers sporting in the water like a "school of porpoises" with never a fear of being drowned. I might add that the water in which these children exercise their limbs is not always as clean as one could desire for bathing purposes!

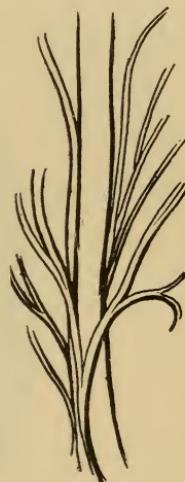
There are some muscles that are not made to control the movement of the bones at all;

such are the muscles of which the internal organs are composed,—such as the heart and the stomach. We are not able to direct the action of these organs, in any way, while those of the limbs can be moved at will.

You will learn, in your text-book on Physiology, something about another set of fibers quite different from those that compose the muscles.

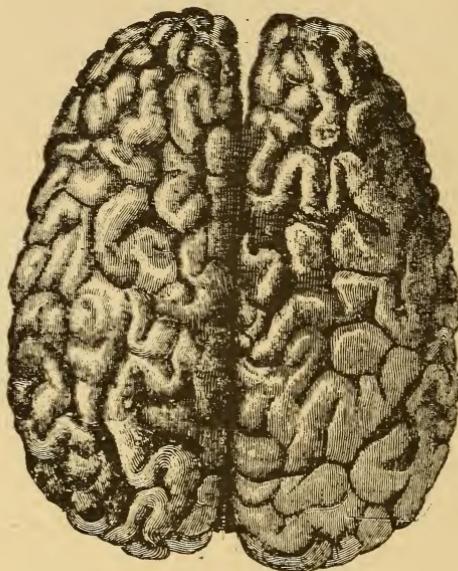
These fibres are called "nerves;" and as the muscles govern the movements of the bones, so the nerves govern the movements of the muscles.

These nerve-fibers act as little messengers, darting about through every part of the body, even through the bony framework, itself; while the brain is the chief source from which each message is sent, and to which every answer is returned; and were it not for these



NERVES.

swiftly flitting messengers, we would have no more sense of feeling than little Miss Primrose and her waxen friends, of whom we read in the opening chapter of this book.



VIEW OF UPPER SURFACE OF THE BRAIN.

Both the brain and the nerves must be nourished by pure blood, otherwise, all the other parts of the body will suffer: in fact, it is the brain and the nerves that give the first

signals of danger when the system is being injured either by impure air, unwholesome food, or poisonous drinks.

"But what has all this to do with the "House that Jack built?" you inquire.

Why, don't you see? Good food, pure water, pure air and a proper amount of exercise make good blood; good blood makes good bone, muscle and nerve; good bone, muscle and nerve make a good house for the soul to live in: and if you and I are careful to obey the laws of health, we may each of us have just such a house of our own.

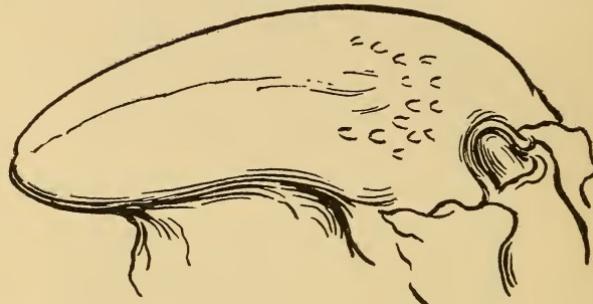
And now do you not agree with me that a house made for the soul to live in, is a far more wonderful structure than one that is merely made for the comfort of the body, such as the house that Jack built?

THE TONGUE.

influenced
maxim
papilla
papillæ

examination
microscope
occasion
disturbed

monitor
operation
sensitive
similar



“ Now, open your mouth and shut your eyes
And I'll give you something to make you wise.”

This “ something ” I am going to press against the roof of your mouth, and upon the inside of your cheeks, and I will also place a bit of it under your tongue.

You must not touch the upper surface of your tongue to any of these places till I give you permission.

There! it is done, but you cannot tell me what it is! Now I will touch it to the edge and to the upper surface of your tongue.

"Oh, I know what it is," you exclaim, "it is candy!" You are quite right, and we have proved, beyond a doubt, that the tongue is the special organ of taste; for you did not know that it was a sweet substance until it came in contact with the tongue itself, did you?

Many people will not believe this until they have proved the truth of it for themselves; and that is right; for it is always better to "see with your own eyes," and to "hear with your own ears," than to depend wholly upon what you read in books, or upon what people tell you.

But I must add, that the sense of taste is greatly influenced by the sense of smell. We sometimes say of things that have a pleasant odor, "That smells good enough to eat;" and we have no desire to taste things that have a disagreeable odor.

We may even close the nostrils and swallow some kinds of food, as a bit of raw onion, without knowing whether it is really an onion or an apple; but in this case, the onion must not be strong enough to "bite" the tongue!

Do you ever swallow any portion of your tongue? "No," you reply; and you laugh at a question that seems to you so absurd. But I can prove to you that you are mistaken. Do not be frightened, however, for there is an old maxim, that "The tongue lasts as long as life lasts." So there is no danger that you will ever swallow it all!

The tongue is covered with a delicate membrane which is raised up in very little bunches. Each little bunch is called a papilla (pa-pil-la), a word that means pimple. When we speak of two or more of these little pimples we call them papillæ (pa-pil-le.)

There are several different forms and

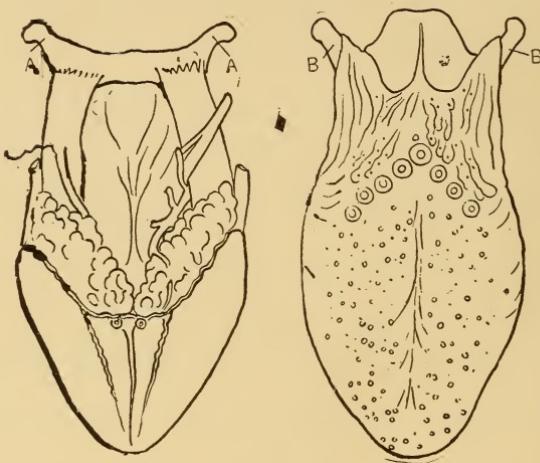
sizes of these papillæ; and those upon the edges and upon the tip of the tongue are much smaller than those upon the back part of it, towards the root. They are constantly falling off and being replaced, and we swallow thousands of them every day. In fact, we swallow a portion of the tongue with every meal we eat !

You will be still more surprised, I am sure, when I inform you that both you and I have a little garden in our mouths,—Yes, a real, little garden of our own !

Let me tell you how this is.

Both the food that we eat and the water that we drink contain many tiny germs of plant-life ; and the warmth and moisture of the mouth help them to thrive and to multiply very rapidly. In this way, we are never without them, and one or more of them may be taken from the mouth at any time for examination under the lens of a microscope.

However, these small germs do us no harm; and if we are careful to keep the teeth well brushed, and the mouth clean, we shall never have any occasion to feel disturbed about this tiny garden of ours, that we can neither see nor taste nor feel!



UNDER SIDE OF TONGUE.

UPPER SURFACE OF TONGUE.

A B, Bone at root of tongue.

Here is a picture of the tongue, showing how it is fastened to a strong bone that holds it in place at the root. It does not look as if it could ever be taken out, does it? And yet,

should it be necessary to take the tongue out on account of disease, it can be done.

The general color of this organ, in health, is of a pale red; but the tongue of a tobacco smoker is usually of a dirty white; and a foul condition of the tongue is sure to affect the breath, so as to make it very disagreeable.

The constant use of tobacco frequently causes the tongue to become diseased; and any substance, no matter what, that bites and stings this sensitive organ, affects the membrane of the throat and of the stomach in a similar manner.

The tongue of many of the lower animals does not differ very much from our own. We all know that the dog has a moist, smooth tongue; and that the papillæ on pussy's tongue are very hard and rasping. It is because of this that she is liable to use it as a comb, in smoothing out her own fur and that of her little kittens.

The tongue of a snail is a beautiful object when placed under the lens of a good microscope. It is closely set with fine teeth which serve the purpose of scraping away the fleshy portion of plants upon which the snail lives.

If you study natural history, you will learn all this, and much more, that will greatly interest you.

Moreover, you will find that these "senseless brutes," as they are often called, are not so entirely devoid of sense that they will take a poison-weed, like tobacco, into the mouth, and persist in chewing it; neither will they swallow strong liquids that burn and destroy their stomachs.

Are we then, so much wiser than they? I will leave that question for you to answer.

THE EAR.

surprised	exposed	ability
nevertheless	precaution	lessened
auricle	injurious	approaching
gristle	piercing	disappointed

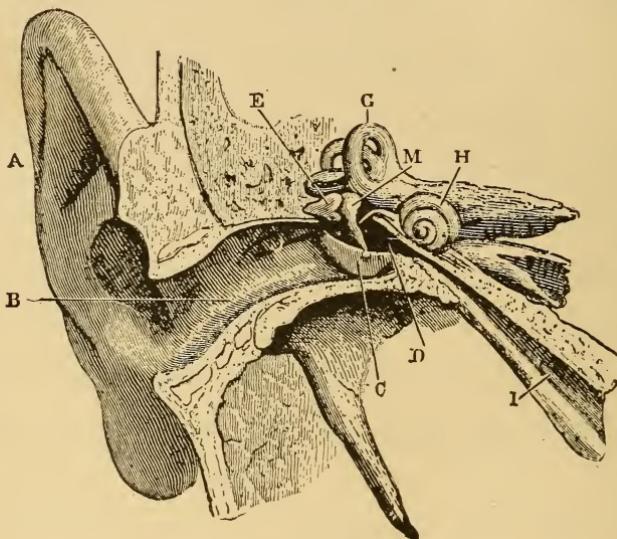
You tell me that you are fond of music, and that you have both an organ and a piano at home. I am not surprised to hear that; but I can tell you something, at which you will be greatly surprised, I think. It is this:—

You have not only this organ, of which you speak, but you actually have two others, and two small drums besides! You have never seen them it is true, but nevertheless they are yours.

“Where are they?” you inquire.

I will show you a drawing of them, and then you may be able to answer that question for yourself.

Here is a picture of the human ear. Look at it carefully, please, as I mention the different parts. You will see that there are three separate parts.—the Outside, the Middle and the Internal ear.



THE EAR OF THE RIGHT SIDE

A, auricle; B, external canal; C, drum, partly removed; D, cavity of middle ear. E, anvil, and M, hammer—small bones of the middle ear; H, cochlea, and G, semi-circular canals of internal ear. I, Eustachian tube passing from the cavity of the middle ear to the throat.

Observe first, the outside part, called the auricle (aw-ri-kl). This name comes from a Latin word which means “the ear.” It is also

sometimes called the wing of the ear because of its form.

The special use of the auricle is to collect sounds; and possibly you may have noticed that people who have dull hearing, often hold the hand behind the ear, as if to enlarge the auricle, so that they can more readily "catch" the words of a speaker.

From the opening of the auricle, a narrow passage, about an inch long, leads to that portion of the ear which is hidden from sight.

This narrow passage is called the canal of the ear. You have observed, perhaps, that the auricle may be easily bent and folded upon itself, because there is no bone in it to make it stiff and hard.

The canal of the ear, on the contrary, is composed partly of bone and partly of gristle; and across the lower end of it, is stretched tightly a very thin membrane. This mem-

brane forms the head of the drum, of which I spoke at the opening of this chapter.

It is the duty of the canal to convey sounds to this membrane or "drum-head," which in turn, causes sound to enter the middle ear.

Both the drum-head and the canal are oiled with a soft, bitter wax. It is believed, by some, that this bitter oil is to prevent insects from creeping into the canal, when a person lies asleep upon the ground, or when the ear is exposed at any time in the open air.

Be this as it may, it is certain that the oil also serves the purpose of keeping the lining of the canal from becoming hard and dry; and should too much of it collect and harden near the drum of the ear, as sometimes happens, it should be removed by a physician who makes the treatment of the ear his special work.

"Boxing" the ears of a child is a cruel practice, and in some cases it has broken the

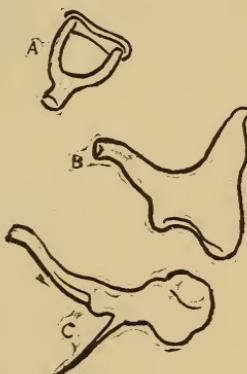
head of the drum and so caused the loss of hearing.

Taking care to breathe through the nose instead of the mouth, is a good way to guard the ear from damage.

One should carefully avoid taking frequent "colds" as it is apt to bring on an attack of sore throat which is more or less injurious to the organ of hearing.

It is a careless thing to run pins, needles and other sharp instruments into the canal of the ear, as there is much danger of piercing a hole in the drum-head.

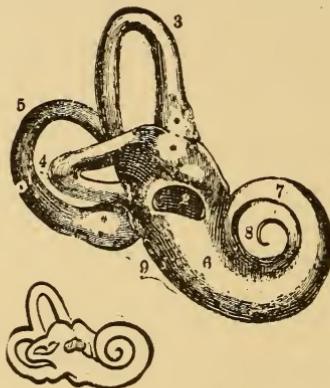
Just behind the drum-head is the middle ear. This contains three very small bones, and each bone has received the name of an object which it somewhat resembles in form. One of them is called the stirrup, another, the



A, stirrup. B, anvil.
C, mallet.

mallet, and the third is called the anvil. Each one of these little bones has its own special work to do in helping us to hear.

There also, is a tube, about two inches in length, that leads to the throat, and conveys air from the throat to this part of the ear.



BONY INTERNAL EAR OF THE RIGHT SIDE.

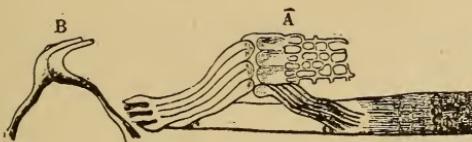
The upper figure magnified, the lower of the natural size.

In order to hear well, there must be an equal quantity of air on each side of the drum-head; therefore, if this tube becomes closed, either by taking cold, or from any other cause that prevents the air from passing freely

through it, the ability to hear plainly becomes greatly lessened.

The internal ear is still more deeply hidden away than the middle portion; for it is hollowed out from a very hard bone of the skull.

In this internal portion of each ear, there are two little "ear-stones" that are made up of fine particles of lime called "ear-sand;" and these tiny stones also have a part in helping us to hear.



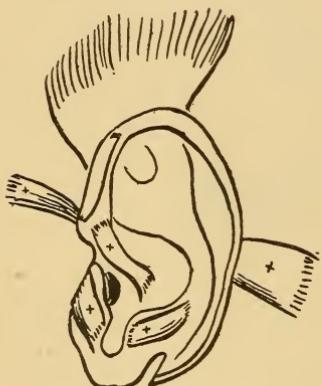
ARCHES OF ORGAN OF EAR (VERY HIGHLY MAGNIFIED.)

Besides all this, there are several small canals, some bottle-shaped sacs or pouches, and a large number of blood vessels and nerves: is it not all wonderful?

But the most wonderful thing of all, is a tiny organ, having a curious keyboard made

up of thousands of little fibres, set side by side!

The extreme ends of many branches of the large nerve of the ear are touched by the fibres of this little keyboard; and it is in this way, by means of this small organ in your head, you are able to hear the kind of sounds which you make on the large organ in your parlor!



MUSCLES OF THE EAR.

Among the lower animals, there are some whose sense of hearing is very keen. Some also have muscles connected with the external ear, for which human beings have no use. Have you not observed how quickly the

horse, the dog, and the cat can "prick up their ears," as we say?

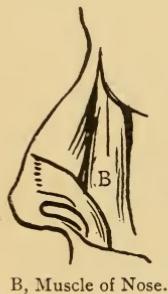
I often see horses do this, on approaching

a drinking-trough, after they have been driven along a dusty road on a hot day; and I have no doubt, they are greatly disappointed when they are not allowed to quench their thirst.



THE NOSE.

gristle	statues	afflicted
ploughshare	inflamed	swollen
determine	catarrh	assumes
aquiline	perforated	continuation



B, Muscle of Nose.

We learned in the last lesson that the External ear has been compared to a wing; and now we are to learn that each side of the lower part of the nose is called the "ala," a word which also means a wing.

These wing parts are composed of gristle, as you can plainly see by pressing upon them with the finger; but the nose is not wholly made up of gristle.

On the contrary, it contains several bones, some of which have very queer names; for

example, the bone that separates the two nostrils, is called the "vomer," a word that means a ploughshare.

It seems a little odd that one should carry a ploughshare about on the face, does it not?

It is this bone that determines the shape of the nose. Thus, when it is hooked a little at the end like the beak of a bird, it is said to be aquiline (ack-wi-lin). This name comes from a word which means an eagle. A nose of that form is said to be of the Roman type; and many fine portraits and statues of the ancient Romans represent the nose shaped in that way.

The two side bones of the nose help to form the nostrils; and these nostrils, opening as they do directly into the throat, act as perfect air-tubes, by means of which we are able to breathe, with the mouth firmly closed. When the delicate lining of these tubes

becomes inflamed, from frequent colds, it often leads to catarrh.

In each nostril there are some flat bones covered with a very thin membrane; and at the base of the nose, between the eyes, there is a long plate pierced with fine holes; this is called a perforated bone.

This perforated plate is covered on both sides with a thin skin, or membrane; and upon its upper side are found the ends of the nerves of smell that lead from the brain.

A large number of nerve-fibres pass through this perforated plate to the thin membrane that covers the bony plates of the nostrils; and when these nostril plates or their covering become inflamed by catarrh, or from any other cause, it affects the sense of smell, and sometimes destroys it.

This sense of smell is much keener in the upper part of the nostrils, and that is why we "snuff up" a pleasant odor.

Have you ever noticed a number of fine hairs at the opening of the nostrils? These hairs serve as screens to keep the dust out.

The nose is connected with nearly every bone of the skull, so that if this organ be diseased any part of the head may easily become affected.

Care should be taken to avoid "frequent colds;" for this often brings on catarrh and other diseases that injure the sense of smell.

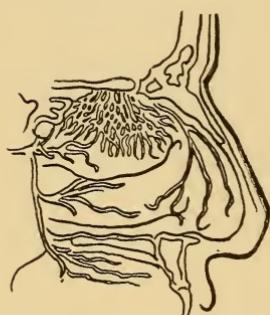
People who are afflicted with catarrh, often snuff up fluids of various sorts, as a remedy for the disease; but this is not a safe thing to do, as such fluids frequently affect both the throat and the ear-passages.

The "lobe" or end of the nose is sometimes greatly changed, both in form and in color by the use of alcoholic drinks; in such cases it generally becomes a good deal swollen, and assumes a purplish hue.

The shape of the nose may also be

changed by pressure: and there are certain savage nations that flatten the noses of their children by this means, in order to make their noses look shorter; as they consider a short nose a mark of beauty.

And now let us consider, for a moment, the sense of smell among the lower animals. Both the dog and the cat, as you probably know, possess this sense in a very high degree.



DISTRIBUTION OF NERVES OVER
INTERIOR OF WALL OF NOSE.
TRIL.

We may say the same of the rabbit and of many other wild animals that seek their living in the depths of the forest. This keen sense of smell often warns them of danger.

The reason why it is so keen is because the ends of the nerves of smell are spread over a large surface that comes in contact with the outside air.

Have you ever looked at the nasal open-

ing of a bird's beak? You will find them on the upper part of the beak, between the eyes.

I once saw a little girl who was afraid of the harmless, barn-yard fowls: because whenever she came near them, she said they "opened their noses" at her! I am afraid she did not know their beaks from their nostrils.

But the elephant has the queerest nose of all: his huge trunk is only a continuation of his nostrils; in fact, his nose is really a long double tube, by the aid of which he is able to draw up water and pour it into his mouth.

You can learn in your Natural History, many more interesting things about the special senses of the lower animals, than I am able to tell you here.

THE SKIN.

PART I.

elastic	scarfskin	complexion
encased	margin	pigment
cuticle	frayed	warty
dermis	replaced	reptiles

Yesterday, "Uncle Ben" said to me, "Do you know that you are walking about between two bags?"

That was a queer thing to say; but I have found that, in one sense, he spoke the truth; for the skin that covers and protects the external parts of the body serves as the outer bag or sack, while the thin membrane that lines the internal parts of it may be called the inner bag or sack.

You can see that the inner sack is much thinner than the outer one, if you will compare

the skin of the lips, of the nostrils and of the ear-passages, with that of the face or of the hands; and in some parts of the body it may be found even thinner still.

When you try on a kid glove for the first time, it generally fits so closely that you can scarcely bend your fingers, and your hand feels stiff.

Now the skin that covers and protects these bodies of ours is made to fit even more closely than a kid glove; but it is so elastic that it yields to every movement of the parts which it covers.

If this were not so, how very stiff and awkward we would appear! Think of Miss Primrose and her friends, encased in white kid skins, and that will give you an idea of it! Ah, but the covering of the living body is something very different from that, as you will see when I tell you how it is made up.

The skin is composed of two layers; the

outside or surface layer is called the cuticle, (ku-ti-kl), a name that comes from a word meaning "the little skin;" and just beneath this, is another layer called the dermis (der-mis) a word that means "the true skin."

The cuticle is made up of several layers of cells, as you will see by looking at the picture on page 19.

This cuticle or outer covering is often called the "scarf skin;" and if you prick it with a pin or a needle anywhere, you will not feel any pain and it will not bleed; for it contains neither blood vessels nor nerves. The thick margin at the root of the nails is a part of this skin.

Sometimes a portion of this margin becomes frayed and loose so as to affect the true skin underneath, then we call it a "hang-nail;" and it is often very painful.

"But since this surface skin does not aid the sense of feeling, at all, of what use is it?"

you inquire. It is of great use, for it serves to protect the very sensitive, true skin that lies beneath it, and of which I shall tell you, by and by.

If you will scrape the back of your hand with your finger nails, you will see that this scarf-skin is composed of little scales. These scales were the cells that made up the layer of the surface skin, and which become flattened as they reached the top.

If you will rub your body briskly with a flesh brush, or a coarse, dry towel, you may see these scales falling in a shower of white powder.

As soon as they are removed, the layer of cells that was beneath them begins to harden into scales which in turn, fall off; and so the surface layer is being constantly thrown off, and as constantly replaced. Thus we shed a portion of our skin every day of our lives, without ever feeling the loss of it at all!

The lower portion of this surface layer contains a large number of paint-cells in which a coloring matter is stored; and it is this paint that gives a tint to the complexion; it is called "pigment," a name which comes from a word which means "to paint."

This pigment is furnished by the blood vessels of the true skin, and it not only tinges the skin, but it gives coloring to the hair as well.

You know that the people of some countries have fair complexion and "light colored" hair; while others, as the Negro race, have just the opposite.

"Have you any freckles upon your face and hands?" These are little grains of pigment matter; and if you expose yourself to the rays of the hot sun, they will increase in number.

You do not know, perhaps, that your nails, your eyelashes, your eyebrows and your

hair, are each and all of them an out-growth of the skin. They are, as you know, entirely destitute of blood vessels and of nerves, and are formed from layers in the surface skin.

So are the horns and hoofs of a cow, the mane and tail of a horse, and the wool of a sheep. It is the same with the thin, pearl-like scales of your gold-fish, the thick, shaggy hair of your dog, the soft, smooth fur of your cat, and the sharp beak—as well as the bright feathers—of your canary bird; these are but different forms of skin growth that are shed and renewed at stated periods, during the life of these animals.

Certain insects, also, as grasshoppers, spiders and some others, shed the entire skin several times before they reach their full size.

If you find any toads in your garden, watch them carefully; for it is a funny sight to see them pull off their coarse, warty hides.

Have you ever seen the cast-off skin of a

snake? I have found quite a number of them that were strong and tough, and almost perfect in form; for these reptiles never part with their coats till they are quite sure that they have a better one underneath! Are human beings always as wise as that? Not when they are willing to barter their last garment for strong drink, as some men have been known to do.

THE SKIN.

PART II.

scale-skin	interwoven	stoker
absorb	section	perspiration
multitude	abundant	morphine
go-betweens	moisture	injected

And now that we have learned something about the scale-skin that covers the surface of the body, let us study a little the structure of the true skin that lies beneath it.

This true skin is filled with blood vessels and with nerves; and it is this layer which gives to us the sense of touch.

Have you any corns upon your toes? I hope not; but if you do chance to have one, you can pare off a good portion of it without feeling any pain.

But as soon as a sharp pain darts through it, then you have touched a little nerve of the *true* skin that quickly carries its complaint to the brain.

The upper surface of the true skin is raised up, into a countless number of fine pimples, called papillæ (pa-pil-lee); and it is in these papillæ that the nerves are found which give to us the sense of touch.

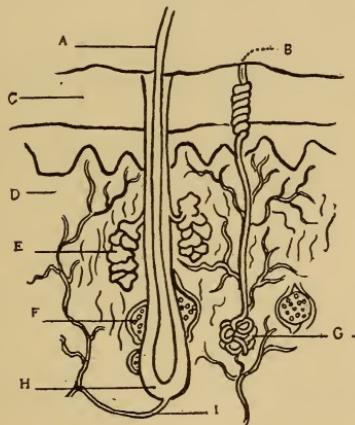
This sense of touch is very delicate in the tips of the fingers, at the end of the tongue, and in many other parts of the body; but it is much lessened in the fingers of people who perform hard labor with the hands; for in such cases, the surface-skin becomes thick and horny, and that deadens the sense of feeling.

The true skin contains not only a countless number of nerve and blood vessels, but here we also find a multitude of little glands, some of which are filled with oil, others with water, or "sweat" as we call it.

Both of these fluids ooze out from the walls of the blood vessels which course through the skin in every direction. And oh, such tiny blood vessels they are! You

cannot pierce the skin, anywhere, with the finest needle, without finding one.

These tiny vessels are the little "go-betweens" that connect the arteries with the veins, and they are so very closely interwoven among themselves, that it is impossible to make out where an artery ends and where a vein begins.



VERTICAL SECTION OF THE SKIN.

A, Hair; B, Sweat pore; C, Epidermis, or outer layer of skin; D, Dermis, or inner layer of skin; E, Oil glands; F, Fat cells; G, Sweat gland; H, Hair bulb; I, Blood tube.

Here is a picture that shows you a section of the skin with its numerous nerves, blood vessels and glands.

The oil glands serve to keep the skin soft, so that it may not easily be "chapped" in cold weather.

These glands are also abundant in the scalp, at the roots of the hair. They are generally very active, and perform their work well; so that if the scalp be clean and if the hair be carefully brushed every day, there will be no need of using oil and other greasy dressings to make the hair smooth and glossy.

You will see by the picture, that the sweat glands are placed in small pits in the deep parts of the skin.

Each gland is a little, pink body made up of a tiny tube that is rolled and twisted in and out upon itself, in a sort of loosely wound ball.

I have sometimes seen balls of candy rolled and twisted up in this same way, and they always remind me of the picture of a sweat gland.

You will see that the little ducts or tubes leading up to the surface-skin, are a part of

the glands themselves, and that some of them become a good deal bent and twisted in their upward course.

This happens where they pass through a thick portion of the skin ; but in places where the skin is somewhat thinner, the tubes are quite straight.

These sweat glands are always active ; although we never notice it unless the body is very warm ; then we become “sweaty,” as we sometimes say.

The tiny openings or mouths of the sweat tubes are called “pores” ; and if you could see them, you would find thousands of them upon each finger-tip of your hand alone !

If you put on a thick, rubber coat and wear it for several hours, outside of your other clothing, you may find it as wet upon the inner side as if it had been rained upon ; and yet during the whole time you may not be aware of feeling “sweaty” !

This shows that the glands are always at work; but our garments allow the moisture to pass through them, because they are loosely woven, but rubber does not permit water to pass through it: hence, it is not well to wear rubber boots or any garment of like material, except when protection from bad weather makes it necessary.

Now, it is highly important that the skin be kept clean, so that the little sweat tubes may always be in working order; in other words, that the pores of the skin should not be choked up with foul matter.

Does this sweat that passes out from our bodies, then, contain impure matter? Most certainly; and in this way, the skin performs a very active part in removing injurious, waste material from the blood.

For although a drop of sweat looks like a drop of clear water, yet it contains carbonic acid and other substances that are harmful to

health; and a good many drops contain a large amount of poison.

It is said that a "stoker" who feeds the furnace of an ocean steamer, often loses two pounds weight in one hour; and all this passes off in the form of sweat or "perspiration," (which is the more proper word to use), through the pores of his skin.

But while the little sweat tubes are able to pour out such a vast amount of waste material from the blood, they are also able to drink in or "absorb," as we may say, many substances, some of which are helpful, and others harmful.

A physician, if he should have a scratch upon his hand, is very careful when he dresses a poisonous wound of a patient, lest the tiny tubes exposed in the scratch of his own hand drink in poison from the wound.

There are some plants, you know, which you are afraid to touch because their poison-

ous sap is carried to your blood by the pores of your skin ; they make your hands itch ; such plants may cause your hands to swell and to become very sore. And again there are people who take morphine (mor-fin) into the system by having it injected under the skin where the pores absorb it. This is a habit that ruins the health, and soon causes the body to become a wreck.

We should not only keep the body clean, by taking frequent baths, but we should be careful to wear clean clothing next to the skin ; otherwise, the little mouths of the sweat tubes may absorb some of the foul matter, that clings to an under garment which has been worn too long.

It is always safer to wear flannel next to the skin in winter ; and, in cold climates, a thin flannel garment should be worn even in summer time.

But, while the tiny pores of the skin drink in substances that are harmful to the blood,

they also absorb much that is helpful to every part of the body; and while they allow carbonic acid gas to pass out, thus freeing the blood of its impurities, they also take in a large amount of oxygen.

It is for this reason that the skin is sometimes called the third lung; and, if it is kept in proper order, it is, indeed, a great helper of the lungs.

Now, since we know this, we will be more careful than ever to live in the open air, will we not?

And we will be very sure to take frequent baths, to wear clean under garments, and to rub the body briskly with a coarse towel, or with a flesh brush now and then, so as to keep the little pores in working order; for, since nature has provided us with such a perfect covering, we shall be greatly at fault if we do not try to take good care of it.

THE EYE.

PART I.

pupa	monarch	intense
transparent	expansion	concave
cornea	retina	convex
iris	focus	spectacles
	irregular	

I once read a story about a powerful monarch who kept five of his servants busy all the time, telling him what was going on in his kingdom.

The strangest part of it was that he could understand perfectly well what was said by each one of them, even when they all spoke together!

Now, we may look upon the brain as the monarch or ruler of the body, whose five watchful servants are the organs of taste, sight, smell, hearing, and feeling.

We have already learned a little about four of these special organs, and now we will try to find out something about the most beautiful and the most wonderful of them all.

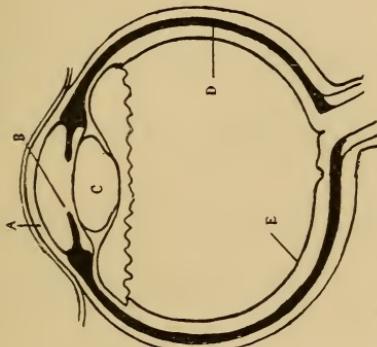


DIAGRAM OF THE EYE.

A, Cornea; B, Iris; C, Lens; D, Choroid or second coat; E, Retina.

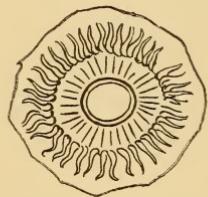
Here is a little diagram of the eye; let us examine it carefully. We may not be able to learn all about its different parts; but we may learn how to take care of it, so as to protect it from injury.

The eyeball is a very delicate organ, as you know; but it is so safely lodged in a deep,

bony socket of the skull that it is quite "out of harm's way."

You will observe that it has three coats or coverings. The outside coat is called the "white" of the eye; and you can see a portion of this coat (which is covered in front by a thin, transparent membrane), either by glancing at the mirror, or by looking at the eyes of another person.

This coat is strong and tough; and fastened to it are several muscles that control the movements of the eyeball.



FRONT PART OF EYEBALL,
SEEN FROM BEHIND.

The front part of this coat is shaped something like the crystal of a watch-face. It is very clear and transparent, so that the rays of light can pass readily through it into the eye.

This transparent portion is called the "cornea," and just back of it is a little muscular curtain called the "iris," a word that

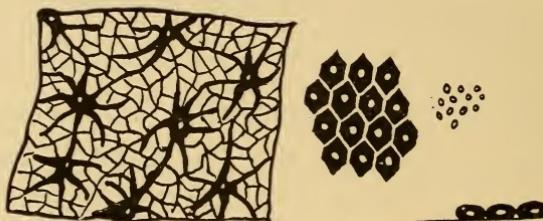
means rainbow. The rainbow, as you know, is made up of several colors; and it is the iris that gives a particular color to a person's eyes, as black, brown, blue, gray, etc. You have all noticed how marked this is in a cat's eyes.

In the center of this "rainbow" curtain is a round hole called the "pupil." The name "pupil" comes from a Latin word that means baby. When you look into the eyes of another person, you see there a small image of yourself—a baby-image, or pupa. By means of this iris, the pupil becomes smaller in a very bright light, and larger when the light is dim. You may notice this in the eyes of a person who comes from a dark room into a lighter one, or the reverse.

Just beneath the outer covering of the eye is the second coat, which extends only to the border of the cornea. This coat is full of blood vessels, and abounds in pigment cells.

Pigment, you know, is another name for

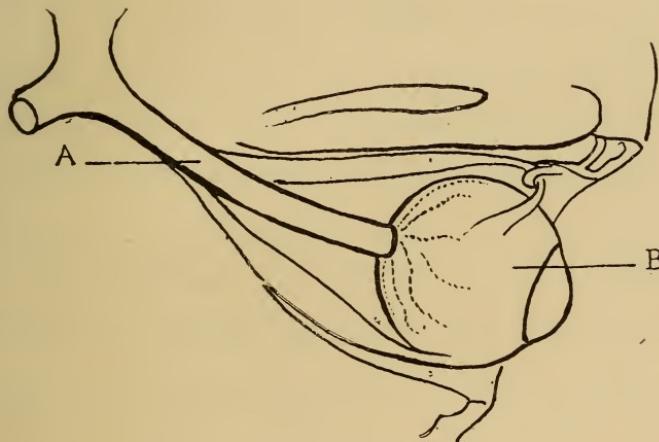
paint; you learned all about that in your lesson on the skin. This paint, or pigment, as we will call it, protects the eye from being pained with too strong a light; as when we look upon a very white surface, such as a sandy beach, a snowy landscape, or even upon a building that has been painted white.



PIGMENT CELLS IN SECOND COAT OF EYE.

You know how a bright sunlight often dazzles your eyes, but it would be almost blinding to you without this dark pigment coat, which softens, as it were, these intense rays of light. You really would be no better off than the owls that have to fly about at night, because they lack the protection of this coloring substance.

The third, or inner coat of the eyeball is a very thin, delicate membrane, formed by the expansion or spreading out of the large nerve of the eye.



DIAGRAM, SHOWING LARGE NERVE OF THE EYE.

A, Optic nerve; B, Eyeball.

This nerve leads from the brain, and passes through a small opening of the bony socket in which the eye is set. It pierces also both the outer and the second coats of the eyeball, and then spreads out so as to form the third or inner coat.

You may as well learn the name of this

inner coat right here. It is called the retina (*ret-i-na*), a name that signifies a net; and it is well named too; for the large nerve of the eye is spread out at the back part of the ball like a thin, gauzy network.

There are certain parts of the eyeball that have the power of bending or changing the direction of the rays of light which enter the pupil, so as to bring them to a focus upon the retina; the cornea is one of the parts that possesses this power in a considerable degree.

But in some cases there may be an excess of this power, and in others, there may be a lack of it. In either case, glasses are needed to correct the fault. These glasses that are set into spectacle frames are called lenses.

Now, in order to see an object, the rays of light that are reflected from it through the pupil must meet at a point on the retina in order to form a perfect image in the eye; this point is called the focus.

But it sometimes happens that a person's eyeball is too long; and in such a case the rays of light meet before they reach the focus, so that no very clear picture of the object can be formed upon the retina.

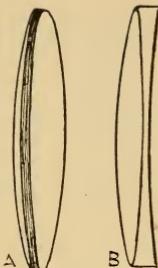
We may say of such a person that he is "near-sighted," and, in order to help his sight, he must wear concave glasses that will cause the rays to meet at the proper point.

Again, the eyeball may be too short; then the rays of light reach the retina before they come to a focus, so that no clear picture can be formed without some effort; and yet the person may not know that he is making an effort at all.

In fact, he is "straining" his eyes to see without knowing it.

We say of such a person that he is "farsighted," and he also must wear spectacles to remedy the defect.

But in this case convex glasses must be



worn. Here is a picture of two lenses; one of them is convex and the other is concave; you will see that they are shaped quite differently.

There is another condition in which the sight is said to be irregular. This happens when some of the rays of light are brought to the proper point upon the retina, while others are not. In fact, the use of spectacles is needed in all cases where there is any difficulty in seeing.

THE EYE.

PART II.

membrane	spectacles	distressed
frequently	lenses	sufficiently
considerable	cornea	filmy
excess	twilight	interlace

Some people have formed a habit of holding an object very near the face in order to examine it closely; and it is believed by some, that this practice will in time cause the eye to become "long-sighted." Be that as it may, it is an awkward habit, and should be avoided.

Children who find it necessary to hold a book near to the face, or who partly close the eyes when they read, in order to see better, should have their eyes examined by a physician who makes the treatment of the eye his special work; for, generally, such children need glasses to help the sight.

Sometimes children complain of headache, day after day, and very often they are obliged to stay away from school on account of it, and thus fall behind in their lessons. All this is frequently due to a defect of sight, that a pair of properly chosen glasses might easily remedy.

The eye is indeed a wonderful organ, and we cannot take too much pains in the care of it. I have often seen people sitting in their rocking-chairs, reading, hour after hour, and rocking while they read. Thus the printed page moves backward and forward at unequal distances from the eyes, and, in this way, the eyeballs, striving to accomodate themselves to the moving object and varying distance, become strained and weakened. There is the same danger in reading upon the cars, in a swinging hammock, or in any place where the body is in constant motion.

Reading at twilight or by aid of a dim light is also harmful to the eyes; and many

people injure their sight, beyond help, in this way.

One should never face the light when using the eyes closely; on the contrary, the light should fall, either from behind or from the left side. When writing, it is always better to have the light fall from the left side, as the shadow from the hand will then not be in the way.

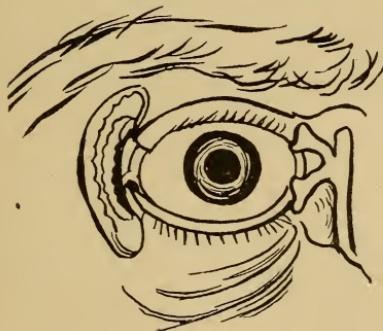


DIAGRAM OF EYE.

Showing tear glands to the right.

Do you sometimes shed tears when you cannot pass your examinations, or when you are greatly disappointed about something?

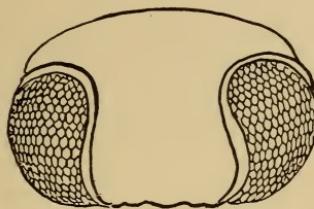
Do you know where these tears come from that stream down your cheeks when you give way to weeping? There is a gland in the hard, bony socket of the eye that holds these tears.

This gland is ever active, so that the eyeball is always kept moist; and, as fast as the fluid is poured out, it is carried off into a tube that leads to the nose; but when we are greatly moved, either by sorrow or by joy, the gland pours out more fluid than the tubes can well dispose of, and then it is that the eyes overflow with tears.

It is not known that this ever happens to the lower animals, although the statement has been made that a mother bird sometimes sheds tears when robbed of her young. I have seen birds so distressed when this cruel thing has been done, that I am inclined to believe that birds may shed tears.

It is said that the eyes of a fish are not supplied with tear-glands, as the water in

which they live keeps the eyeballs sufficiently moist.



EYE OF INSECT (MAGNIFIED.)

The sense of sight in the insect world is very keen. The common house-fly appears to have but two small organs of sight; but these small organs are made up of thousands of still smaller ones; and it is the same with the eyes of nearly every insect.

The eyes of the lower animals are very much like our own; but horses, birds, toads, frogs and some others, have a third eyelid, which they can draw quickly over a portion of the front part of the eyeball. This thin eyelid, although somewhat transparent, is filmy, or "cloudy" as we might say, and so these crea-

tures can bear a very strong light. It is on this account, that the sharp-eyed eagle is able to look at the sun; but this membrane gives to the organ of sight a "blear-eyed" appearance, and, as the sun's rays cannot pass easily through it, it really serves as a thin veil of protection to the sight.

Look in a mirror, and you will see, on the inner corner of either eye, a small, pink fold of very thin membrane. This is an imperfect, third eyelid of your own, which cannot be drawn over the eye, and for which we have no use.

Have you ever thought how odd your face would look if you had no eyebrows? I am quite sure that you would miss them, if by accident they should disappear; for they really serve to shade the eyes when in a strong light; and, yet, there is a certain tribe of Indians that shave off both the eyebrows and the eyelashes, because, as they say, they do not want to look

like horses ! Moreover, they often paint the eyelids black, in order to add to their beauty..

Have you ever observed that the eyelashes of your upper lids curve upward, while those of the lower lids curve downward ? Were it not so arranged, it might not always be



DIAGRAM SHOWING MUSCLES OF THE EYE.

easy to open and close the lids, as the lashes might interlace.

In fact, the organ of sight is carefully protected in many ways. Strong muscles are fastened to the outside coat that aid in turning the eyeball in several directions; the tear-gland keeps it moist, the eyebrow shields it from too much light ; the lids serve as a safe covering

during the hours of sleep ; the eyelashes prevent dust from getting under the lids ; and a number of little oil-glands along their edges soften them to keep them in good condition.

And since nature has done so much to protect this wonderful organ of sight, let us be very careful to guard it from injury.

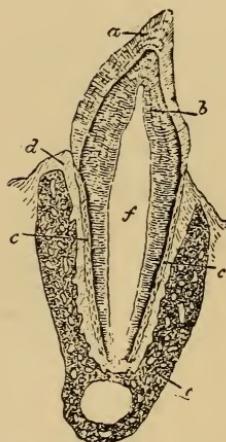
THE TEETH.

inhabitants	tartar	unsightly
civilized	enamel	discovered

A set of strong well formed teeth is greatly to be prized; and yet there are people who do not seem to know the value of them; for the inhabitants of some countries knock out the front teeth, because they do not want to look like dumb brutes!

Other savage tribes stain the teeth black, blue, red and even a bright yellow. They do this because they consider it a disgrace to have "white teeth like dogs!"

Now, I am sorry to say that I often meet people, in our own civilized country, whose teeth are so dark that they look as if they had

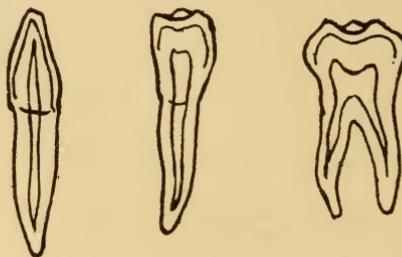


STRUCTURE OF TOOTH
(MAGNIFIED.)

A, Enamel; B, Dentine;
C, Cement of fangs; D, Fib-
rous membrane; E, Bony
socket; F, Pulp cavity.

been stained in some way. This comes from neglect, for which there is really no excuse.

If the teeth are not properly cared for, they soon become blackened by a crusty coating called tartar. This crust is composed chiefly of lime and animal matter, mixed with the sticky fluid that supplies the glands of the mouth; and this tartar, if left upon the teeth, soon causes them to decay.



KINDS OF TEETH.

Incisor.

B'cuspid.

Molar.

“What can I do then, to keep this ugly, black tartar from spoiling my teeth?” some one asks. You can keep your teeth entirely free from it, and it will cost you but very little care. “How?”

Be sure to brush your teeth well after each meal; but let me warn you not to use a brush that is too hard and stiff; for it will wear off the smooth enamel or outside part.

Be careful to remove small bits of food that lodge among the teeth: this is best done by passing a thread of fine, white silk between them.

The mouth is always very warm, and particles of food that remain between the teeth soon decay; this is not only injurious to them, but it affects the breath as well.

As soon as a tooth begins to ache, it should be examined by a careful dentist; for it is a pretty sure sign that it needs filling; and if a tooth is filled at the proper time, it will prevent further decay and do good service for years.

Drinks that are either very hot or very cold are harmful to the teeth, as they are apt to crack the smooth coating of enamel that

protects the teeth. Gnawing the finger nails, biting off threads, and cracking nuts with the teeth often injure the enamel, and even wear upon the substance of the tooth itself.

It is unnecessary to add that the use of tobacco is harmful to the teeth and to all parts of the mouth, as it is indeed, to all parts of the body; and how unsightly does a person's teeth become when discolored by the use of this vile weed!

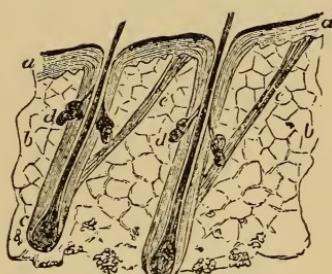
THE HAIR.

admires	cleansing	borax
promoted	mixtures	diluted
scoured	ammonia	calculated

Every body admires a fine head of hair; but in order that the health and growth of the hair may be promoted, it must receive a certain amount of attention.

It is well supplied at its roots with nerves, muscles, blood vessels and oil sacs; and if the scalp be kept in good condition, these busy little workers will perform their tasks well.

The hair should be brushed and combed at least twice a day; and great care should be



HAIR, HAIR FOLLICLES AND GLANDS.

A, epidermis; B, true skin; C, hair bulb
D, glands; E, muscle attached to hair
sac-

taken as to the kind of brush that is used upon the scalp,—that is, it should not be too harsh.

Some people have an idea that the scalp must be frequently “scoured” with certain cleansing mixtures, such as those that are made of borax or ammonia diluted with water.

This is a mistake; for these mixtures are too strong for the roots of the hair, and often bring on baldness; it is well to wash the hair sometimes, with soft, warm water, and even a weak suds may be used; but strong “soap-lather” is harmful.

As I told you, in our lesson upon the skin, it is not necessary to daub oil and other forms of grease upon the hair; for the tiny oil-sacs at the roots will attend to that.

It is calculated that the hair grows in length about six inches during a year, and, with proper care, it may possibly grow still more in that time.

Long hair is generally considered a mark

of beauty; indeed even among savage tribes much pains is taken to promote its growth; and it is stated that a certain Indian Chief had a head of hair that was nearly eleven feet in length.

One would hardly wish to be burdened with hair as long as that; but among these Indians, the man who could boast of the longest hair was made Chief of the tribe!

THE NAILS.

resemble	scraping	appearance
seashore	roughness	untidy
measure	ornament	finery

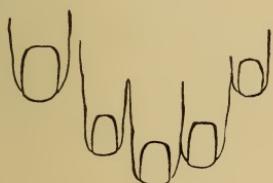
If you look at the finger nails of an infant, you will see that they closely resemble the beautiful little pink shells that are to be found along the seashore.

But as the child gets older, and learns to use his hands, his nails become somewhat hard and thick, and lose in a measure, their pretty pink color; by proper care, however, they may be kept in very fair condition, even if the hands are busily employed most of the time.

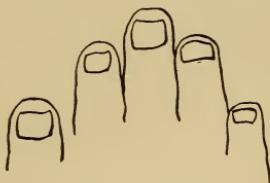
The use of a good brush is almost as necessary for the nails as it is for the teeth or for the hair; it keeps the under portion of the free edges clean, and gives to the upper surface a fine polish.

It is well to cut the edges with a pair of scissors or with a knife; but it is still better to use a little file to keep them of the proper length.

Scraping the upper surface of the nail is a bad practice; for it not only makes the nail hard and stiff, but causes it to roughen still more, and destroys its polish.



WELL-KEPT NAILS.



NEGLECTED NAILS.

The nails are a protection to the fingers, and they should be an ornament; but they too often become unsightly by neglect.

In fact, a lack of proper attention to the care of the teeth, of the hair, and the nails will give a person an untidy appearance that no amount of "finery" will conceal.



Photo by J. M. Smith, October

EDISON OLD FAITHFUL
YELLOWSTONE PARK.

MINERAL WATERS.

doubtless	Virginia	Bohemia
disturbed	delicious	Carlsbad
relieved	filtered	Arkansas
lithia	substitute	remedies

Perhaps some of you may have been to some mineral or Healing Springs; and if so, you doubtless enjoyed sipping the water that bubbled and sparkled in the glass as you received it fresh from the earth.

When you were there, did you drink at all the springs, and did you take large quantities of it every day? If so, it was really a very unsafe thing to do; and it is a wonder that it did not make you ill.

Why? Because most mineral waters contain medicine in some form, that quickly affect the stomach, the liver, the intestines and other parts of the body.

These medicines are not prepared by a druggist, it is true; but they are composed of substances that are quite as strong as many of the drugs that the doctors order for people who are ill.

Many of these mineral drinks are delicious; but after all, there is nothing that we enjoy more than a cup of clear, cold water coming from a pure spring in its natural state.

Why is it that we so often feel the need of a drink of water? You have already learned that the sweat glands take up, or "absorb" as we say, a large quantity of water from the blood; and when a great amount of perspiration passes off, as it always does on a hot day, the blood is robbed of its rightful share of water.

Then it becomes too thick, and demands a new supply; and this produces a feeling of thirst, which is generally relieved as soon as

the blood receives its rightful share of water again.

But you already know that there is really no need of taking much drink of any kind with your food, if you give the glands of the mouth a chance to do their work, by chewing your food slowly and well.

In Bohemia, a country of Austria, there is a great number of mineral springs; and some of them are even more famous than those at Saratoga.

Look on your map and you will find in the north-western corner of Bohemia, the name Carlsbad; (Karls-bot). This word means Charles's bath; let us see why it is so called.

There is a legend that the German Emperor, Charles the Fourth, when on a hunting excursion one day, discovered a boiling spring flowing out of the cleft of a rock. Perhaps it would be more correct to say that the Emperor's dog made the discovery; for the poor

animal tumbled into it and was badly scalded before he could be rescued from his boiling bath.

That was more than five hundred years ago, and although it seems a very long time, yet it is asserted upon good authority that the springs of Carlsbad were discovered even before this incident occurred.

Be that as it may, the Emperor built a palace near the spot, and the springs soon became noted as a healthful bathing resort; for no person thought of drinking the water as a remedy for disease, until several years afterwards.

But these waters really were found to possess many healing properties that make them valuable; and in fact, we may say that all mineral waters if rightly used are helpful remedies for disease.

Do you know what causes it to bubble and to sparkle in the glass as you hold it to your lips?

It is the carbonic acid gas, with which it is charged, struggling to escape; for strange to say, although this same gas is a poison that we fear to draw into the lungs, yet it may be taken into the stomach with perfect safety; indeed, it often has a good effect upon the nerves of that organ.

You have learned that the gastric juice of the stomach acts upon the food that enters it so as to change it into blood. Now it has been found that carbonic acid gas often helps to increase this supply of stomach juice; it also has a soothing effect upon the nerves of the stomach and aids somewhat its movements in "churning" and shaking up the food that it contains.

So on the whole, the drinking of a moderate quantity of mineral water often proves to be a good thing, as it assists in the process of digestion.

But right here let me tell you a little

secret. It is this: people who live on plain, wholesome fare, such as brown bread, fruits, vegetables, milk and a moderate amount of meat, seldom find it necessary to resort to mineral springs in search of health.

It is said that the Hot Springs of Arkansas and of many other similar resorts in our own country, are thronged with people who have never learned how to live.

There is an old adage that people must "live and learn;" but if they do not learn how to obey the laws of health then must they learn to suffer pain.

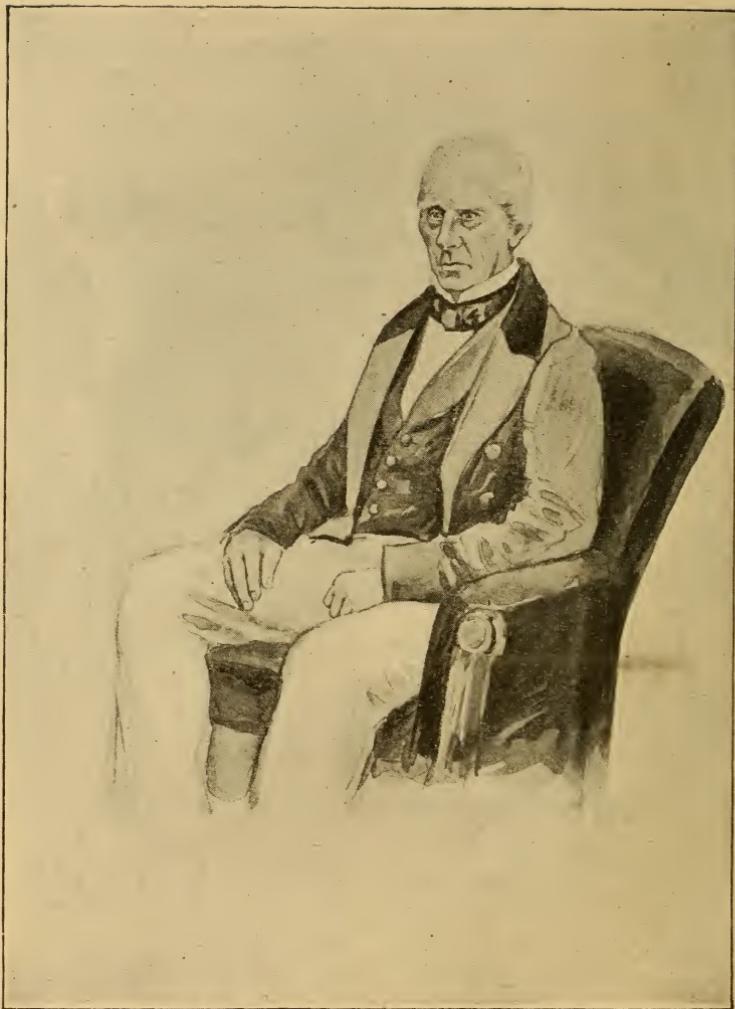
It sometimes happens that we inherit disease from our parents, or it may be, from our grand-parents, and in that case we are not to blame for being ill; but it is safe to say that much bodily suffering comes from a disregard of the laws of health.

Many an invalid is warned by his physician to abstain from tobacco and from strong

drinks; but he is such a slave to his appetite, that he continues to puff away at his cigars, and to pour strong coffee, tea and even alcohol in various forms, into his stomach, until his system becomes so clogged with poison that medical treatment has no effect; and then he complains of dyspepsia!

The most common rules laid down for invalids at the various health resorts, are these:— A plain, wholesome diet,— frequent baths,— plenty of sunshine,— and moderate exercise in the open air. But why may we not observe these simple rules at home?

It is a pleasant thing to travel, either in our own country or in a foreign land; and there is great enjoyment and much knowledge to be gained by it; but without the blessing of health there is little pleasure to be found anywhere.



THE HAUNTED HOUSE.

PART I.

THE NEW HOUSE.

continued	haunted	regulated	reserved
repairs	architect	stationed	interrupted
tenement	enlarged	guest	studio
Gothic	portico	suite	festooned
advertised	ventilators	queried	hobgoblins

“Dear me!” groaned Uncle Jacob Ross, dropping into his armchair and placing his walking-stick within easy reach of his hand.

“Dear, dear me! and to think that there is no help for it now, no help at all!” he continued, with another groan.

“What *is* the matter, Uncle Jacob?” asked little Nettie, tumbling Pussy over and over on the floor under her feet, in her eager

haste to reach the high-backed armchair in which Uncle Jacob was sitting.

"Not anything that you can help, child," replied her uncle, in a weary tone. "I was only thinking of an old house of mine that is just ready to tumble down."

"Oh, is that all?" answered the little girl, "I was afraid that you were very ill."

"Indeed, it is quite enough to make me ill," said the old man, "when I remember that the fault is all my own, and that I might have kept the building in fine condition if I had tried; but now it is too late even for repairs," he added, with a sigh.

"Is it the little brown cottage that you gave Widow Dart 'cause her son was killed in the coal mines last summer?" inquired Nettie.

"No, my pet, not that; it is a much poorer tenement than that, I can promise you."

"Is it the old house by the bridge, that

you rented to Harry Jones about a year ago?"

"No, not that either; guess again, my dear."

"Well, then, it must be that great, lonesome farm-house in the country, that you advertised for sale the other day."

"Nettie," said the old man, in a solemn tone, "the house of which I am speaking is in such a very bad condition just now that it is not fit to sell, to rent, nor yet to give away.

"In fact, no one could even be hired to live in it; for the wretched old castle is haunted, and it *has* been haunted these twenty years."

"Haunted, Uncle, haunted by real spirits, real ghosts!" cried Nettie, with wide opened eyes.

"Yes, child, real ghosts roam through and through the house every day," said her uncle, gravely.

"Oh, do tell me all about it," she exclaimed; and then stopping short she added, "But I thought you did not believe in ghosts, you have told me *that* many and many a time."

"Ah, yes, my dear, but I am obliged to believe in these evil spirits, because I can see them, hear them, and even feel them for myself."

The old man smiled sadly as he spoke, and bade her take a seat near him, that he might tell her a strange but true story of the old, Haunted House.

"When I was a very small boy," he began, "so small, indeed, that I cannot remember anything at all about it, this house, newly built, was given me to occupy as long as I lived.

"It was planned by the greatest architect ever known, and I am bound to say that it was a fair dwelling then,

"It was quite small, to be sure, and it had to be enlarged from time to time; but it was very complete in all its parts.

"Its timbers, at first, were composed of more than two hundred separate pieces; but after a while thirty-two more small pieces were added.

"The entire building was supported by two stout columns or pillars, and it was well protected from the weather by over five hundred smooth clap-boards, each fitting nicely the place for which it was intended.

"These clap-boards were arranged in double layers, but sometimes there were four or five layers, and even more, placed one above another."

"Did they look just like the clap-boards on the sides of our barn?" enquired Nettie.

"No, they did not *look* like them," replied her uncle, "but they were arranged something in the same way that the boards on the barn

are placed, or clapped over one another; and that is why I call them *clap*-boards."

"And did this fine house have a pretty portico, and was it all covered with morning-glories and vines?"

"There was a small portico in front of the upper story of the dwelling, and I dare say there were plenty of flowers and vines everywhere about, in those days," answered Uncle Jacob, smiling sadly, as he stroked the sunny ringlets of his little niece.

"But this portico was quite a different thing from the one that you have in mind, my dear," he said.

"This one had two doors that opened into passages leading to all the apartments in the upper story, as well as to a music hall below; but the main entrance to the music hall was a wide door, just below the portico, which opened upon one of the most wonderful organs that was ever made."

"How I do wish that somebody would give me such a fine house," said Nettie. "What good care I would take of it always."

Her uncle shook his head and said, "Wait a little, my dear, wait a little.

"The middle story of my dwelling contained two large rooms of nearly equal size, with a broad hall between them which had several openings leading into narrow, winding passages connected with every part of the mansion.

"These two rooms of the middle story were well supplied with ventilators in various forms, which, if they were properly regulated, would admit a constant and plentiful supply of fresh air, during any season of the year."

"And did you live in that house all alone, uncle?" asked the little girl.

"I was about to tell you, my child, that in every hall and apartment of this beautiful dwelling, there were servants stationed to

serve their master's bidding at a moment's notice.

"In the upper stories of the house there were two guest-chambers; one of them was somewhat larger than the other, but both of them were furnished in delicate colors of gray, pink, and white, and each of the chambers was double, forming a suite of ante-rooms."

"Oh, I wish that I could have had those pretty rooms, all to myself," said Nettie, clapping her hands with delight. "Tell me, Uncle, did you ever have any company to stay with you all night?"

"Yes, yes, I had a good many visitors, I can promise you; and very amusing it was to study the make-up of some of them."

"And what were they like?" queried the child.

"It would not be easy to answer that question, my dear; for some were grave and some were gay; some were worthy of the

welcome that I gave them, and I am sorry to say that some of them were no better than they ought to have been.

"But the front rooms of the mansion were always reserved for the highest class of visitors, and they were at liberty to remain as long as they pleased."

"And did you have books and pictures, and all that?" interrupted the child.

"There was plenty of space for a fine library and studio," replied the old man, "but I am ashamed to say that I allowed the library shelves to become covered with dust and mold, and the studio was often festooned with unsightly cobwebs."

"But which room did you like best of all, Uncle?"

"I believe I liked the dining hall best; for its tables were always loaded with every luxury of the season; and just here, is where the story of the hobgoblins begins."

THE HAUNTED HOUSE.

PART II.

THE HOBGOBLINS.

frightful	reservoirs	vestibule	tottering
squirmed	stalked	succession	amazement
handsomely	scythe	terrified	neglected
utensils	vestige	writhe	including

“Oh, I am so glad that you are going to speak about the ghosts,” said Nettie, “do tell me, Uncle, what happened first.”

“Ah, very well, I will tell you. At first, strange noises were heard in the dining hall, and then frightful hobgoblins began to make their appearance, and finally they came right in, and boldly seated themselves at the very head of the table.”

“And did they eat right off the plates, just like real people?” queried the little girl.

“Not they,” answered the old man.

"On the contrary, they made all sorts of wry faces at me, and twisted and squirmed about, as if in great pain, every time they saw me eat a piece of rich mince pie, a nice, green pickle, a slice of fruit-cake, or a bit of sage-cheese.

"In fact, I could not take a glass of wine, nor smoke a cigar after dinner, without seeing one or more of these ghosts making ugly faces at me."

"Dear me!" said Nettie, "how very disagreeable it must have been; but why did you not order your servants to drive them out of the house?"

"I will explain that by and by; I must tell you now about my nice little kitchen, situated just below the dining hall, and very handsomely furnished it was, too.

"But I am obliged to admit that I allowed the kitchen utensils to be banged and battered about till they became hardly fit for use; and

some of them were so worthless, that I had to purchase very expensive substitutes in their stead.

“ Among this kitchen furniture, there was a pump, a churn, a grinding mill, a sieve, several nice reservoirs, drains, and a number of other articles, that if I could only have them now, bright and new as they were then, I would not part with them for any amount of money.”

“ But the ghosts, Uncle, I want to hear more about the ghosts,” cried Nettie.

“ Ah, well, there was one old fellow, in particular, of whom I shall never lose sight; for even at the present day, he often shakes the crumbling walls of the old building with his cries and groans of distress, every time there is a thaw, a rain-storm, or any signs of an east wind; and all because I did not take care to keep him out of the house, when I had the power to do so.”

As Uncle Jacob uttered these last words, he groaned quite as loud as any unhappy hobgoblin could possibly have done.

“Another gloomy spirit stalked through the upper story, and shut nearly all the light out of the beautifully fringed-curtained front windows, so that false window-lights had to be used in their stead.

“One old hobgoblin, who always carried a scythe on his arm, was in the habit of very slyly scraping the roof of the building, as if he were mowing grass.

“He kept on at this business so long, that he finally destroyed every vestige of the handsome cupola, so that the whole roof of my house was entirely bare of any ornament, whatever.

“Then, there was a little imp who crept into the vestibule of the west entrance-chamber, and sent such a succession of shrieking, roaring sounds through every

apartment of the upper story, that it was almost enough to craze one to be anywhere within sound of his voice.

"Ah, but there was still another little torment even more sly than any of the others; this one placed telegraph wires along every hall-way of the house; and sometimes his sudden telegrams would shake the entire building, till it did seem as if it would fall to the ground.

"This so terrified the servants that they became unable to control themselves, and they would often writhe and struggle in terrible agony."

Here Uncle Jacob paused, and Nettie, finding that he did not go on, asked, "Uncle, do you feel able to walk with me to that old house of yours, I do so long to *see* a ghost?"

The old man motioned to her to pick up his walking stick, and rising to his feet by its aid, he said:

"Here is the old, tumble-down tenement, Nettie, miserable, tottering, and nearly ready to fall; it is called 'Uncle Jacob Ross.'"

The child looked at him in amazement, and then exclaimed in a somewhat disappointed tone:

"But you are not a house, Uncle. Who ever heard of a man being a house, with such elegant rooms and all that fine furniture?"

Her uncle gravely replied:

"I heard a little girl say this morning that she hated her Physiology, that it was a very dull book, and she could see no use in studying its dry, old lessons.

"I felt very sorry to hear her talk in this manner; for I knew that she did not value the nice little house that had been given her to dwell in, and that if she lived to be old, she would be sorry that she had not taken better care of it.

"Although I have sadly neglected to take

care of the beautiful mansion which the Good Architect built for me, I want my little niece to be wiser than I have been, so that in her old age she may have a better house to live in than I possess.

“And now I will tell you, my dear, how a man may be a house.

“First, can you tell me how many bones there are in the body, including the teeth?”

“Two hundred and forty,” answered Nettie, promptly.

“Right. Now the stout, solid timbers of the house are the bones; they form the framework of the building.

“Many of these bones are round and hollow; but they are very strong and solid, withal.

“Now can you name the three principal bones of the legs?”

“They are called the femur, the tibia, and the fibula,” said Nettie.

"Right again," said Uncle Jacob, gently patting the little girl's curly head.

"Well, the strong, upright columns or pillars of the house are the legs, composed of the femur, the tibia, and the fibula.

"The rest of the framework is made up, first, of the backbone, or spinal column,—how many pieces or joints has the backbone?"

"Twenty-four," said Netty, "and twenty-four ribs are fastened to that."

"Ah, we are getting on bravely," cried Uncle Jacob. "We shall soon have the framework of the house completed.

"We must not forget the sternum or frontal bone, which is held in its place by these twenty-four ribs, twelve on each side, fastened at the back to the spinal column.

"And the arms, what shall we call them?"

"The wings of the house," replied Nettie.

Her uncle laughed. "Well, they *are* wings, truly enough," he said, "and so we

will call them the right and the left wings of the building.

“The smooth clapboards, covering and protecting this wonderful framework, are the muscles, five hundred or more in number.

“The upper story is the head; the front windows are the eyes, and the fringed curtains are the eyelids.

“The three-cornered cavities at the opening of the canals of the ears are the vestibules to the entrance-chambers of the upper story.

“The small portico is the nose, and its two doors are the nostrils; the wide door below is the mouth, opening upon that wonderful organ of speech, the tongue; the musical gallery is the larynx, or organ of the voice.

“The two airy parlors are the lungs; and their ventilators or air-passages admit a pint of air at every drawing in of the breath.

“The broad hall which connects these parlors is the heart, the several openings of

which are the blood-vessels; and these vessels have curious valves, which act as trap-doors, whenever occasion requires."

"Oh, yes, I have learned about the little valves of the heart," said Nettie, "and now I can plainly see that they do act like small trap-doors, in keeping the blood from rushing back after it has once passed through the openings.

"But the servants, tell me about *them*; they must each have a name of their own."

"Yes, these faithful servants each have a name and a place in the house; they are called the nerves, and there are two sets of them,—nerves of motion, and nerves of sensation or feeling; and now if you will bring pussy to me, I will show you how well these servants know their business."

"Oh, now we will have a real lesson in Physiology," said Nettie, "and pussy, you shall be one of the class."

THE HAUNTED HOUSE.

PART III.

THE LESSON.

obeyed cerebel'lum festooned proceeded
immediately cer'ebrum alimentary presiding
lodgement hemisphere moderately neuralgia
imagination ignorance discharged intruder

Nettie brought the cat at once and placed it on her uncle's knee.

"Put your finger in her mouth," said Uncle Jacob.

Nettie obeyed, but she immediately withdrew it, for pussy gave it quite a sharp bite.

"That is right, pussy understands what I want," said her uncle, smiling. "And the little servants in *your* house understand their business, too."

"Now, the brain is the seat of sensation

and of motion: and when you put your finger in Pussy's mouth, just now, the servants of sensation, or feeling, that run through the muscles of your hand, sent a message to the brain that she was biting your finger.

"Then the servants of motion received an order from the brain to take your finger out of her mouth.

"I have already told you about the two guest-chambers, in which so many different travelers find lodgement.

"These chambers are the divisions of the brain. Can you tell me the names of them?"

"The smaller chamber is the cerebellum, or little brain, and the front chamber is the cerebrum, or large brain," answered Nettie.

"You manage the hard names in your Physiology very well, my dear, and I hope that, after to-day, you will have a better idea of what they mean.

"But I must tell you that each of these

brain-lobes contains two divisions or halves, called hemispheres, and these are the ante-rooms of each guest-chamber, the pretty rooms so handsomely tinted in gray, pink, and white."

"I know, now, who are the visitors that come to those pretty rooms," said Nettie, "they are our thoughts. Am I not right, Uncle?"

"Perfectly correct," replied the old man, and I think that you have an idea now of what the library and the studio may be; but I will make it a little clearer to you.

"You know that we often put things carefully away on a shelf in the closet, so that we shall know just where to find them. Now, memory and imagination form a sort of library in the brain; and if we do not store up the knowledge which we gain from day to day, the shelves of this library of the brain are left empty, and its walls become festooned with the cobwebs of ignorance."

"And now let us visit the dining hall, that favorite room of the house; this hall is really the alimentary canal which conveys our food to the churn or stomach.

"The stomach is properly a churn, for as soon as a mouthful of food reaches it, it begins to shake and to churn it; until it becomes fine enough to be carried in another form, to the different parts of the body.

"This stomach, when moderately filled, is about twelve inches in length, and about four inches in diameter.

"It should not be crowded all the time, by stuffing it between meals, otherwise it will wear out; it should be allowed to rest, at least, three hours between each meal.

"Eating between meals will wear out anybody's stomach, sooner or later, and then bad-tasting medicines must be used in order to make the food digest properly."

Here Nettie drew from her deep pocket

a handful of crackers and ginger-snaps and threw them at the cat.

Uncle Jacob did not appear to notice this rattling discharge of pastry, but went on.

"The strong grinding-mill is the teeth,—*was* the teeth," he added, tapping his upper false set with his finger.

"But when I was young I used to eat candies, and crack nuts in my grinding-mill, and now I have to use a set of false grinders to atone for it."

Just as he finished the last sentence, there was another heavy volley discharged toward pussy.

This time the shot and shell were composed of walnuts and peppermint drops, which pussy rolled about upon the floor, entirely ignorant of their use; for she had never tasted such dainties as these.

The old man proceeded:

"Although the heart is not located just

where I placed the kitchen of this bodily dwelling, yet it is closely connected with it.

"And by its wonderful valves, some of which are worked by slender, white cords, fastened to stout columns of flesh within the walls of the heart, it acts as a forcing pump, while the liver and the various glands and membranes of the body serve as reservoirs.

"The drains of this dwelling are the kidneys, liver, lungs, intestines, and sweat-glands or pores of the skin.

"Physiology teaches us how to keep all these little drains clean and open, so as to preserve our bodies sound and well."

Again Uncle Jacob paused, and Nettie, eager to hear more about the hobgoblins, cried out, "But the ghosts, Uncle, the ghosts; tell me more about *them*."

"I hope you may never have the misfortune to make their acquaintance," said her uncle, gravely; "but I will introduce you to

a few of them, at a distance of fifty years away, at least.

The presiding spirit in the dining hall is dyspepsia; the telegraph operator is neuralgia; the furious spirit that so much abhors the damp weather and the east wind is rheumatism."

Here the old man raised his right foot and gave it a little shake, as if to drive the bad spirit away; then he continued:

"The gloomy spirit who darkens the front windows is failing sight; the intruder who steals into the west entrance-chamber is deafness of the left ear.

"The old fellow who scrapes off the cupola with his scythe, and leaves my pate *bald*, is Old Time.

"And so I could name a half-dozen more of the tormenting spirits that roam through this poor, old haunted house of mine.

"These are the only ghosts that ever

visit this world; and though you may fall in with some of them before you reach the end of life's journey, there is no need that you should encounter them all.

"If you learn well the laws of health, and obey these laws, you will escape many of the ills that have fallen to my lot, and you will not be compelled to spend the weary years of old age in a Haunted House.

"And now let us go to dinner; and if we are careful to eat nothing but wholesome food, we shall have no hobgoblins to disturb our meal."

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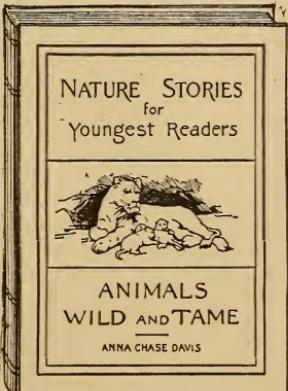
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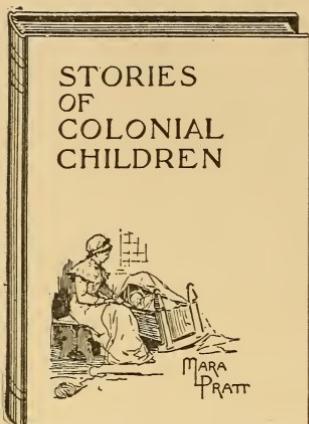
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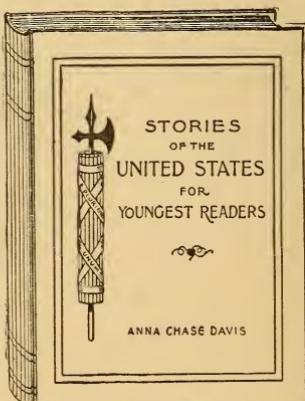
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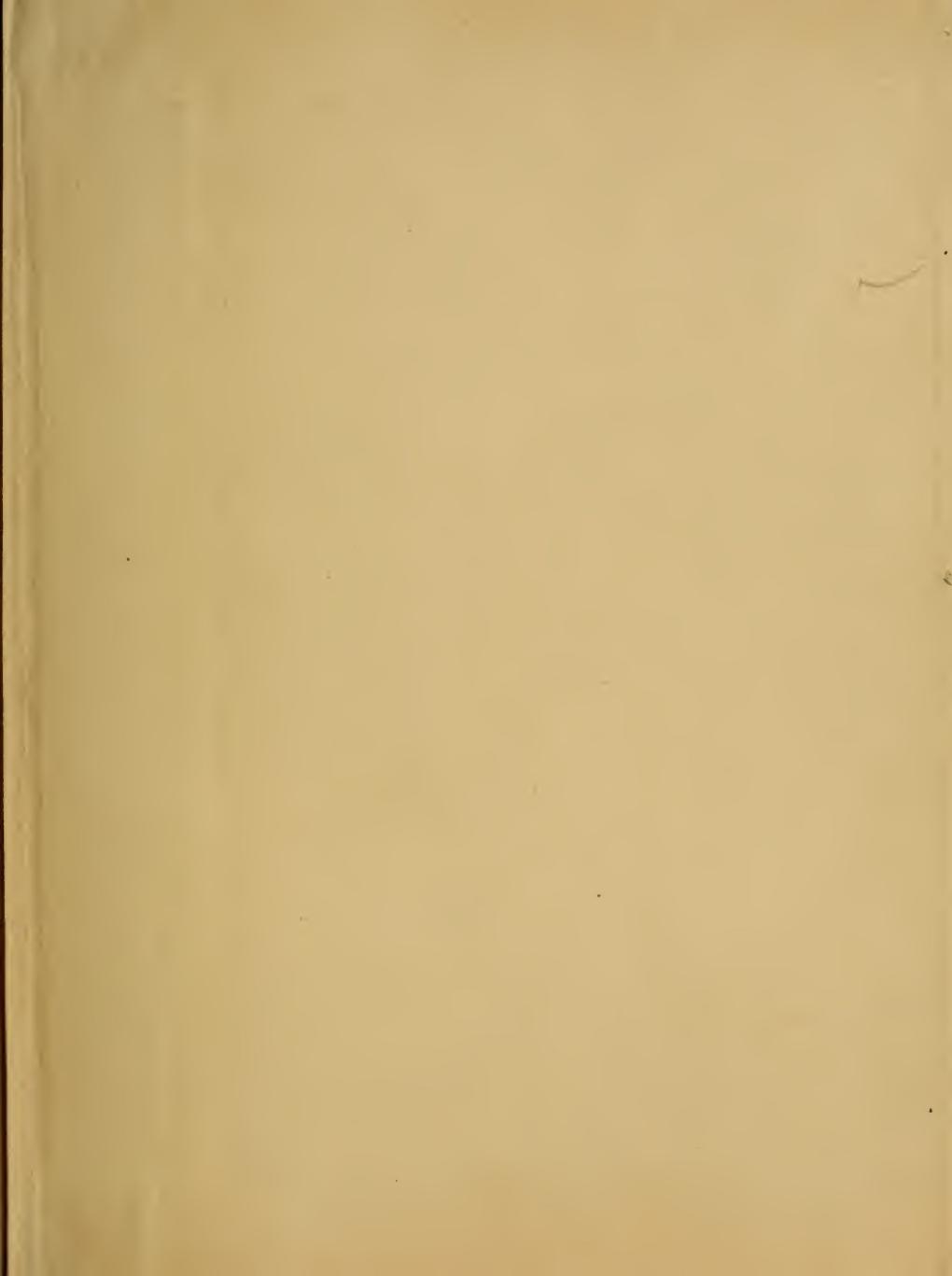
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